FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

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EDITORIAL COMMENT.

A Remarkable German Army Test.

One of the most remarkable tests of efficiency which has ever been carried out since aircraft became an essential part of the equipment of modern armies, has recently been concluded in Germany. In obedience to sudden orders issued by the General Inspector for Aeronautics, twenty-four aeroplanes, each piloted by an officer and carrying an observer, started simultaneously from different centres in flights of three each. The centres were situated approximately 300 miles from Doberitz, which was the common objective. The starting points were Cologne, Posen, Königsberg, Halberstadt, Metz, Strasburg, Darmstadt, and Graudenz (East Prussia), and the orders were that each squadron should follow a prescribed route. The weather during the flight was wet and stormy, but the whole of the squadrons reached Doberitz intact and without accident, the Cologne detachment, which has to travel about 312 miles, accomplishing its prescribed flight in the wonderful time of three hours—an average of 104 miles an hour. After remaining at Doberitz for two days, the squadrons were ordered to fly to Hanover, 240 kiloms. away, which was done—again without accident—in about three hours' average time.

According to the reports which have reached this country, the orders to set out on this really wonderful flight were totally unexpected, and were intended to test the war efficiency of the air corps. There was no time for preparation—the men and machines were taken absolutely by surprise—which makes a wonderful performance all the more wonderful. Its success is about the finest tribute possible to the state of preparedness for war of the German air corps. To us it is of the greatest interest, though we must say that the fact of its accomplishment "gives us to think furiously." We have not the slightest doubt that our own Royal Flying Corps, both Military and Naval Wings, could do exactly the same if ordered. We have the greatest confidence in the preparedness of the army and navy airmen to go forth and do those things for which they exist.

At the same time there is a grave lesson to be taken to heart in connection with this German mobilisation by air. That is that we must by no manner of means underrate the efficiency or the state of readiness for war of a possible enemy. We are becoming accustomed to hear that all is not well with the French service, that Germany is obsessed by the dirigible, and that British machines and British airmen have overtaken and passed the rest of the flying world. There may be much of truth in all these statements which purport to record the facts, but the incident we are discussing should certainly be taken very much to heart by those responsible for our aerial policy, and equally by the nation at large. The last thing in the world that we must do is to fall into a state of smug complacency with regard to our own service. Not that, so long as the direction of affairs is in its present hands, there is much fear of that happening, but then these things have happened in the past, and to be forewarned is to be forearmed. It is impossible to forget in this connection the events which led up to the passing of the Naval Defence Act in the late eighties of last century, when Lord George Hamilton was First Lord of the Admiralty. A long period of peace, combined with the complacent feeling that we were invincible at sea, had led to the neglect of the Navy, until we had fallen into a position of almost hopeless inferiority in relation to the "Two Power" standard. Suddenly the nation awoke to a sense of the peril—and it cost many millions of money and a

time of intense anxiety to regain our position at sea. That is the sort of thing we have to guard against now, and if we are wise we shall go quietly on our way, keeping a watchful eye upon things lest the same should befall.

* * *

Nailed to the Counter.

In face of the many statements that have been made from time to time that Government officials, and particularly those of the Royal Aircraft Factory, have persistently stood in the way of the development of private enterprise, the speech of Mr. Sopwith, at the luncheon given in his honour on Tuesday last, was exceedingly interesting. In effect, he gave much of the credit for his victory in the race for the Schneider Cup to the help received from the authorities. In fact, he went so far as to say that his success was in no small measure due to the fact that his firm had had to build machines to the specifications of the Army aviation authorities, of whom he specifically named General Henderson.

We ourselves have at times felt it incumbent upon us to criticise in no measured terms the policy of the Government in aerial matters, and in particular the want of active interest and direct encouragement of enterprise which at one time characterised that policy. But we have never given credence to the many outrageous reports which have been brought against those responsible for the direction of policy. Our readers will recollect that some little while ago we offered to open our columns to any definite charges, accompanied by chapter and verse, of the kind of thing so freely alleged against the officials of the Air Department generally. It may be also within their recollection that no single concrete reply was made to our invitation—the whole thing ended as it had begun, in an atmosphere of allegation and innuendo, unsupported by a single proved fact. Nor, so far as we have been able to discern, has anyone else been more fortunate (?) in securing evidence of the practices laid to the charge of the authorities. We hold no brief for anyone, but there is an old English proverb which has it that fair play is a jewel, and it is that fair play that we are anxious to see given to everyone all round. Although we were pretty well satisfied that there was nothing much in the charges—the failure of those who brought those charges to respond to our invitation was concrete proof enough of that—we are more than glad that Mr. Sopwith has made such a statement as that to which we listened on Tuesday. It shows that so far from the Air Department endeavouring to stand in the way of the private manufacturer, where that manufacturer is seriously in the business, and has ideas that are worth anything, the officials of that department are only too willing to assist in their development. Which is all as it should be.

* * *

A Sand-Yachting Query.

In our correspondence we publish a letter from a valued correspondent, asking for information as to suitable stretches of sand round the coast for the purpose of sand-yachting. It may be that this is a sport which has a somewhat remote relation to flying, but nevertheless we are much disposed to its encouragement, for the reason that it is at least by way of a cousinly relative, inasmuch as we can well understand that the individual having once tasted the joys of flying without leaving the ground, so to say, will be ambitious to go farther and take to the air. Out of this may easily come something that will materially help towards the development of aviation, and to that end we invite our readers to reply through our columns to the enquiry addressed to them.

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ROYAL FLYING CORPS.

THE following were announced by the Admiralty on the 6th inst. :—

Lieuts. J. T. Cull and B. D. Ash, to the "Pembroke" additional, as Flying Officers, for the Isle of Grain Naval Air Station, for advanced course of instruction, to date April 29th. E. T. R. Chambers, H. A. Williamson, R. J. Bone, and E. R. C. Nanson, to the "Pembroke," additional, as Flying Officers, for Calshot, Isle of Grain, Yarmouth, and Felixstowe Naval Air Station respectively, all to date May 5th.

Capt. C. F. Kilner, R.M.L.I., to the "Pembroke," additional, as Flying Officer, for Dundee Naval Air Station, to date May 5th.

Lieut. C. E. Robinson, R.M.L.I., to the "Pembroke," additional, as Flying Officer, for the Isle of Grain Naval Air Station, for advanced course of instruction, to date April 29th.

Royal Naval Reserve.—Lieut. H. E. M. Watkins, to the "Pembroke," additional, as Flying Officer, for the Isle of Grain Naval Air Station, for advanced course of instruction. To date April 29th.

Sub-Lieut. I. H. W. S. Dalrymple-Clark, to the "Pembroke," additional, as Flying Officer, for Eastchurch Naval Flying School. To date May 5th.

Probationary Sub-Lieuts. C. Draper, H. A. Busk, and E. T. Newton-Clare, confirmed in the rank of Sub-Lieut. R.N.R., and appointed to the "Pembroke," additional, as Flying Officers, for the Isle of Grain Naval Air Station, for advanced course of instruction. All to date April 29th.

The following were announced by the Admiralty on the 8th inst.:—

Staff Surgeon N. J. Roche, to the "Pembroke," additional, for Calshot Naval Air Station, temporary, to date May 7th.

R.F.C.—Lord Edward Grosvenor, to the "Pembroke," additional, for Calshot Naval Air Station, as Flying Officer, to date May 6th.

The following appointments were announced in the *London Gazette* of the 12th inst. :—

R.F.C.—Central Flying School.—Capt. Andrew G. Board, South Wales Borderers, a Flight Commander, Military Wing, to be an Instructor, vice Capt. J. M. Salmond, King's Own (Royal Lancaster Regiment). Dated May 1st, 1914.

R.F.C.—Military Wing.—Capt. John M. Salmond, King's Own (Royal Lancaster Regiment), a Squadron Commander, is granted the temporary rank of Major. Dated May 1st, 1914.

Capt. Charles A. H. Longcroft, Welsh Regiment, a Flight Commander, is advanced to Squadron Commander, and is granted the temporary rank of Major whilst so employed. Dated May 1st, 1914.

The undermentioned Flying Officers are advanced to Flight Commanders. Dated May 1st, 1914 :—*Lieut. George B. Stopford, Royal Artillery ; *Lieut. George I. Carmichael, Royal Artillery ; *Lieut. Edward G. Harvey, Duke of Edinburgh's (Wiltshire Regiment) ; *Lieut. Arthur H. L. Soames, 3rd (King's Own) Hussars ; *Lieut. Felton V. Holt, Oxfordshire and Buckinghamshire Light Infantry ; Capt. Wilfrid Picton-Warlow, Welsh Regiment ; Capt. George E. Todd, Welsh Regiment ; and Capt. Ulick J. D. Bourke, Oxfordshire and Buckinghamshire Light Infantry.

ROYAL FLYING CORPS (MILITARY WING).

WAR OFFICE summary of work for week ending May 9th, 1914 :—

No. 2 Squadron. Montrose.—The Officer and N.C.O. pilots of this squadron were out daily throughout the week, practising reconnaissance. The preparations for the move southwards are nearly complete.

No. 3 Squadron. Netheravon.—Observation of artillery fire was carried out on several days.

No. 4 Squadron. Netheravon.—Besides practising reconnaissance work half of "B" flight took part in a Southern Command exercise during the week. The new power in the workshops is proving satisfactory.

No. 5 Squadron. Farnborough.—The pilots of this squadron carried out observation flights over the district round Aldershot.

No. 6 Squadron. Farnborough.—The machines of "A" and "B" flights were out from day to day.

Aircraft Park. Farnborough.—The workshops have been kept fully employed with repair work on aircraft and M.T. and with the receipt and issue of technical stores of all kinds.

Headquarter Flight. Farnborough.—The flight was engaged in kiting, photography and experimental work throughout the week.

Nos. 1 and 7 Squadrons. Farnborough.—These two new squadrons are in process of formation. Personnel, machines and M.T. will be gradually drafted to them.

* Is granted the temporary rank of Captain whilst so employed.

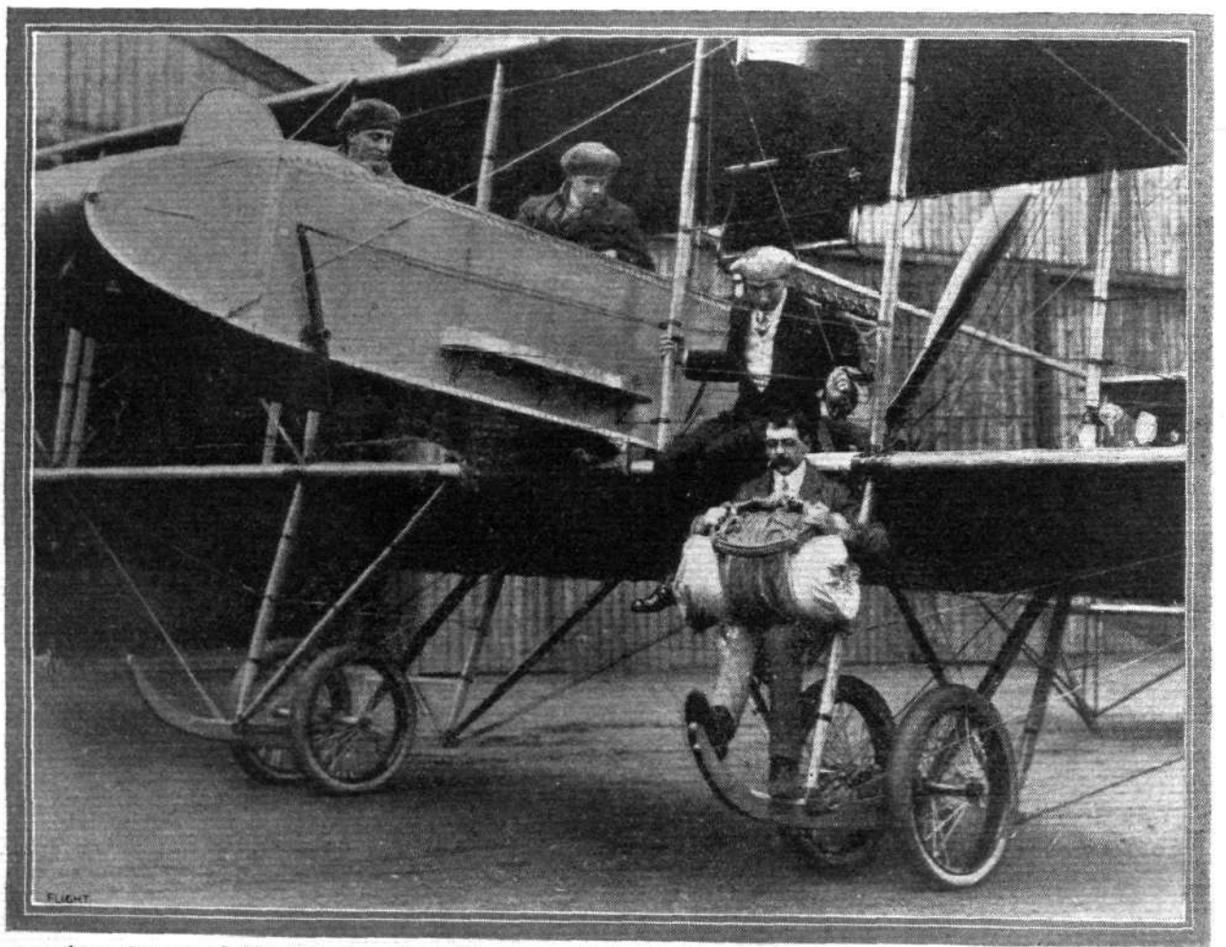
MEN OF MOMENT IN THE WORLD OF FLIGHT

MR. J. LAURENCE HALL, who has a school at Hendon, where he does a good deal of flying on Caudron biplanes and Blériot monoplanes. He learned on a Blériot in 1912, and he has also flown the 80 h.p. Clement-Bayard monoplane.

FLYING AT HENDON.

ALTHOUGH the weather on Thursday afternoon of last week was so bad, two out of the small but enthusiastic attendance of visitors applied for passenger flights, and they were not disappointed, for L. A. Strange gave them each a flight on the 80 h.p. Blériot. One of these passengers, it should be mentioned, was a lady, who thoroughly enjoyed her experience in spite of the unfavourable conditions. No other flights were made that afternoon.

Saturday turned out very dull, with a 30–35 m.p.h. wind blowing, so that the 16-mile cross-country handicap had to be abandoned. At about 3.30 p.m. L. A. Strange ascended with a passenger on the 80 h.p. Blériot, and put up a 15-min. flight in a slight drizzling rain. Shortly after W. Birchenough went up on the 50 h.p. G.-W. bi-rudder 'bus, R. J. Lillywhite making a flight on the same machine a little later on. Strange then made two more passenger flights on the Blériot, whilst Mr. Crawshay started off on a cross country flight with Miss Trehawke Davies on the latter's 70 h.p. Blériot, returning to the aerodrome some 45 mins. later. Pierre Verrier made the next ascent on one of the old-type Maurice Farmans. After climbing until he reached an altitude of about 3,000 ft., where he was at times lost to view behind the clouds, he descended with a beautiful glide with the engine stopped and the propeller stationary. A little after 5 o'clock Marcel Desoutter brought out Lord Edward Grosvenor's 50 h.p. Blériot and made a very good flight of about 8 mins. duration. He started off quite in his old style, climbing very sharply, and made an excellent landing, showing that he has not forgotten the old days. It is indeed gratifying to see this plucky young pilot in the air again, but still we sincerely hope that if he intends to continue flying he will do so with the utmost caution. Lillywhite made one more flight on the bi-rudder' bus, and Strange made two passenger flights on the Blériot before Louis Noel brought out the new Grahame-White 100 h.p. Military biplane which was exhibited at the last Olympia Show. Noel first made two straight flights, and then put up a circuit of the aerodrome. The machine was very fast—well in the neighbourhood of 70 m.p.h.—but seemed to be rather unsteady longitudinally, although very steady laterally. There also appeared to be a tendency for the machine to turn to the right. It would seem, therefore, that our remarks on this machine in the Show report, viz., that the tail should be further back, are borne out in practice. On landing, Noel reported that he had a difficulty in turning with the rudder, the latter being rather small, and that although he had the control-lever almost right back he found it very hard to keep the machine climbing. This suggests that the machine is slightly nose-heavy, and would be even more so if a passenger were carried. It is, of course, very difficult to form an opinion on a new machine during such a short flight, especially as the engine was not running its best; and we must admit that, considering that the machine was on its first practical tests, and that a new machine always requires adjustments, we were otherwise favourably impressed. We must, too, congratulate Louis Noel on his pluck in trying out a new machine under unfavourable weather conditions. After this all the machines were returned to the hangars; but later in the evening an interesting experiment was made. This was a parachute descent from the five-seater biplane. Mr. W. Newell, an experienced aeronaut-parachutist, who was to make the descent, and F. W. Goodden—who has also made numerous parachute descents—after considering various places from where the leap could be made with safety, finally decided that a temporary seat should be made above the left-hand skid of the chassis, so that the parachutist could sit there with his feet on the latter ready to jump off. A rope seat was, therefore, made between the front and diagonal skid struts and all was ready. Newell took his "seat" with his parachute, folded and tied with a breaking-cord, on his lap, and with Carr in the pilot's seat and Goodden and Lillywhite as passengers the aerobus started off at 7.45 p.m. After climbing for 18 minutes, an altitude of 2,000 feet was reached, and then Newell made his leap into space. The parachute opened almost immediately and floated gracefully to earth, Newell swinging about tremendously at first. One of



The parachute descent of Mr. W. Newell at Hendon on Saturday last, when he descended from a height of 2,000 ft. by means of this parachute from a Grahame-White biplane piloted by Mr. Reginald Carr, the descent from the time of his leaving the aeroplane occupying 2 mins. 22 secs. Mr. Newell is seen on the skid exactly as he ascended for the feat, immediately above him being Mr. F. W. Goodden, who assisted him to jump from the aeroplane, whilst in the pilot's seat is Mr. Carr, with Mr. J. Lillywhite in the centre.

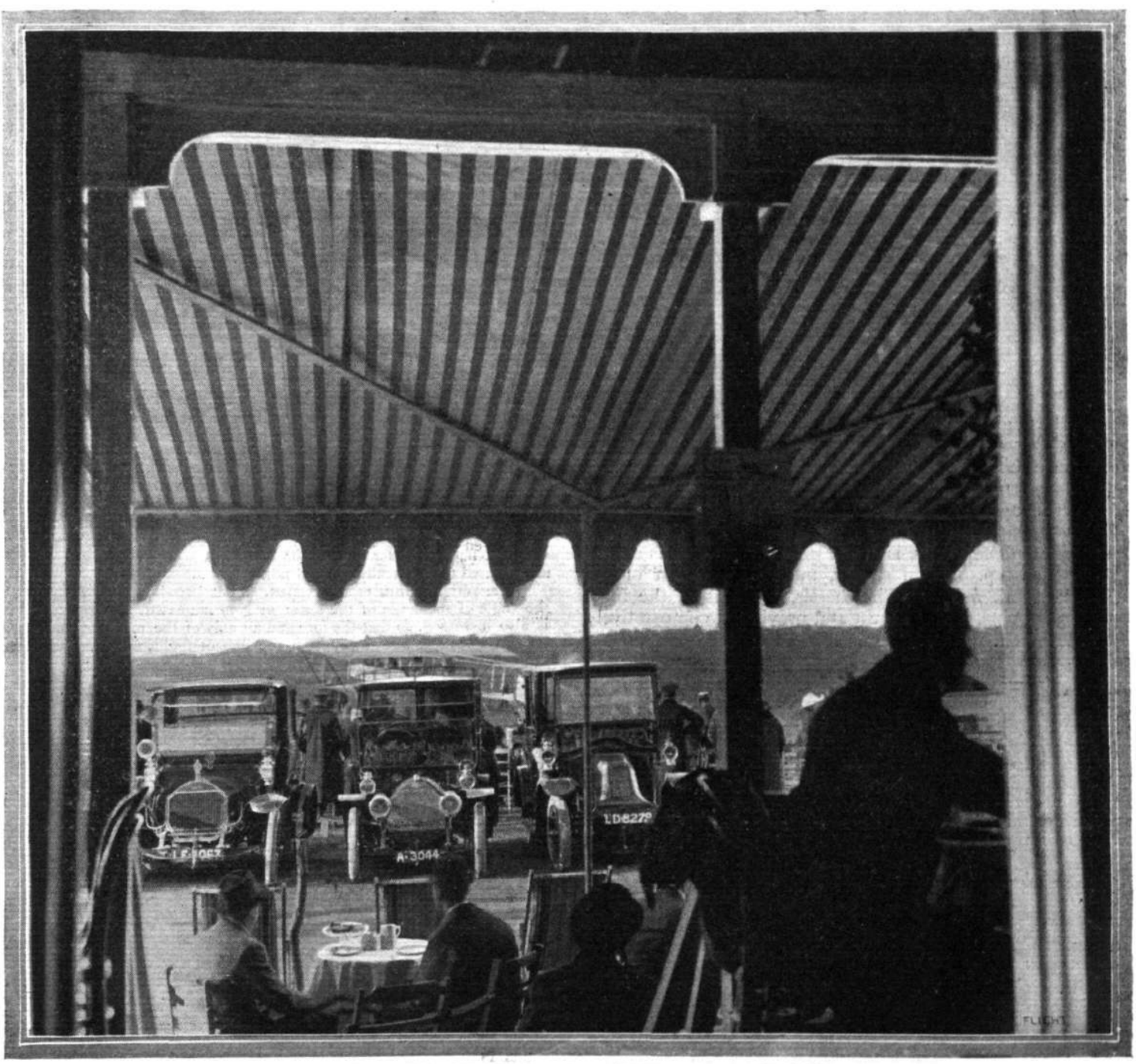
the spectators was George Reynolds, the official timekeeper, who of course could not refrain from consulting his chronometer for timing the descent, which was given as 2 mins. 22 secs. Newell made a successful landing close to No. 1 pylon, and a small crowd was close at hand to give him the welcome he deserved, which consisted of many hand-shakes and "three cheers." A minute or so after he touched the ground the aerobus landed. Considerable amusement was caused by Goodden announcing that he climbed out of the *nacelle* and got close to Newell, and, when the time came, assisted him off with his foot! Newell, however, was so cold, that he did not notice this, in fact he said he was unable to feel if he was standing on the skid or not. The parachute used was a standard type 26 ft. in diameter, 30 ft. long and 40 lbs. in weight. It may be remarked that this is the first time that a parachute descent has been made from an aeroplane in this country, and we understand that a special seat is to be fitted to the aerobus for similar demonstrations.

Dull weather again "favoured" the aerodrome on Sunday afternoon, but there was nevertheless a capital attendance of visitors. Several flights were made by the following pilots:—L. A. Strange, passengers on the 80 h.p. Blériot; R. H. Carr, R. T. Gates, and R. J. Lillywhite on G.-W. 'buses. Carr also flew the Blériot.

Naval and Military Aeroplane Engine Competition.

ON visiting the engine-testing house at Farnborough on Saturday last, it was found that the 130 h.p. Wolseley, the 95 h.p. Dudbridge Ironworks Salmson and the 135 h.p. Sunbeam had been removed from the test beds; and it was anticipated that they would be succeeded by the 120 h.p. Beardmore Austro-Daimler, the 130 h.p. Wessex and, probably, the 90 h.p. semi-aircooled Wolseley engine.

By reason of the fact that the members of the Management Committee are not permitted to give any information respecting the performances of the various engines, it is not possible to obtain any official account of what has already taken place in connection with the competition; while the makers, with whom we have been in communication, whose engines have occupied, or are now occupying, the test benches, are not disposed, at the moment, to discuss what has occurred. It would appear, however, that various mishaps of a very serious nature have happened during the tests of several engines, due, we believe, to trouble with the cardan shaft between the engine and the transmission shaft. But in view of dearth of information of a definite character and our unwillingness to prejudge the matter in the absence of adequate data, we will defer comment.

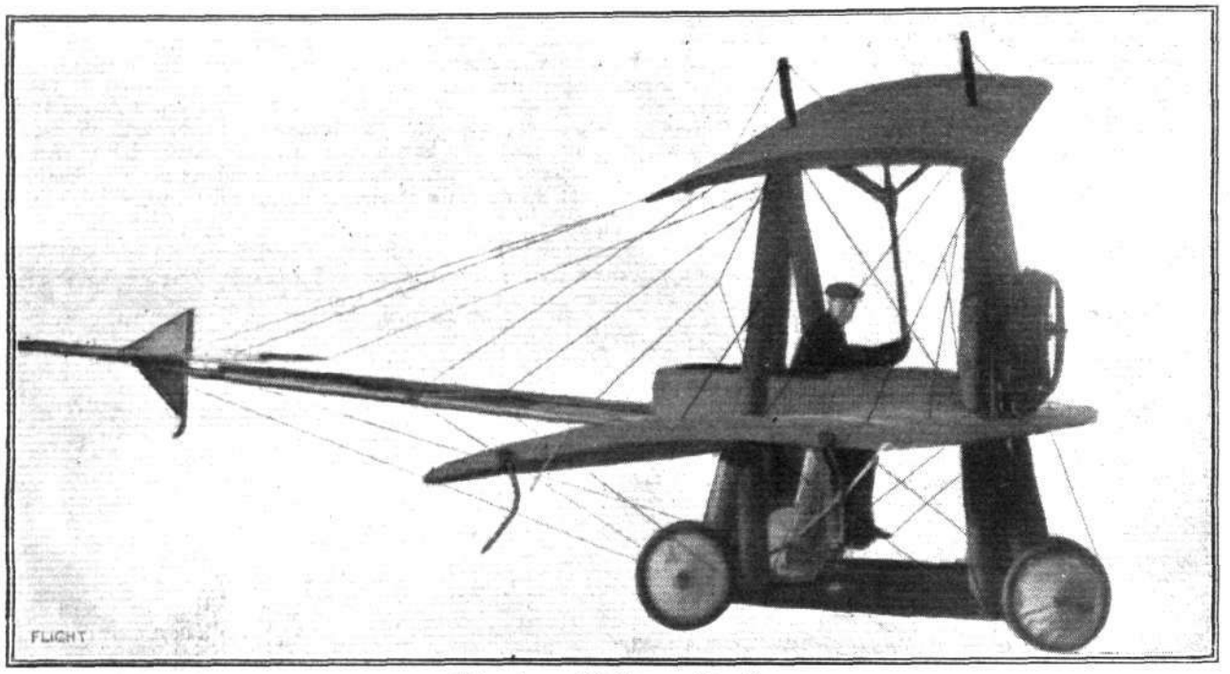


Loading up the five-seater Grahame-White biplane at Hendon Aerodrome, as seen from the pavilion.

THE WATSON ROCKING-WING AEROPLANE.

IN connection with the competition organised by "L'Union pour La Sécurité en Aéroplanes," Mr. P. A. Watson, of Dundee, who has been experimenting with rocking-wing aeroplanes for a number of years, is at present demonstrating his latest type machine (No. 3) at Buc. We have asked Mr. Watson for a description of his machine, and he has sent us a copy of the explanation which, in accordance with the rules of the competition, he has given l'Union. The following extract from Mr. Watson's explanation of the principles of his machine will, we think, make it clear in what respect his aeroplane and the manner in which it is controlled differ from ordinary types.

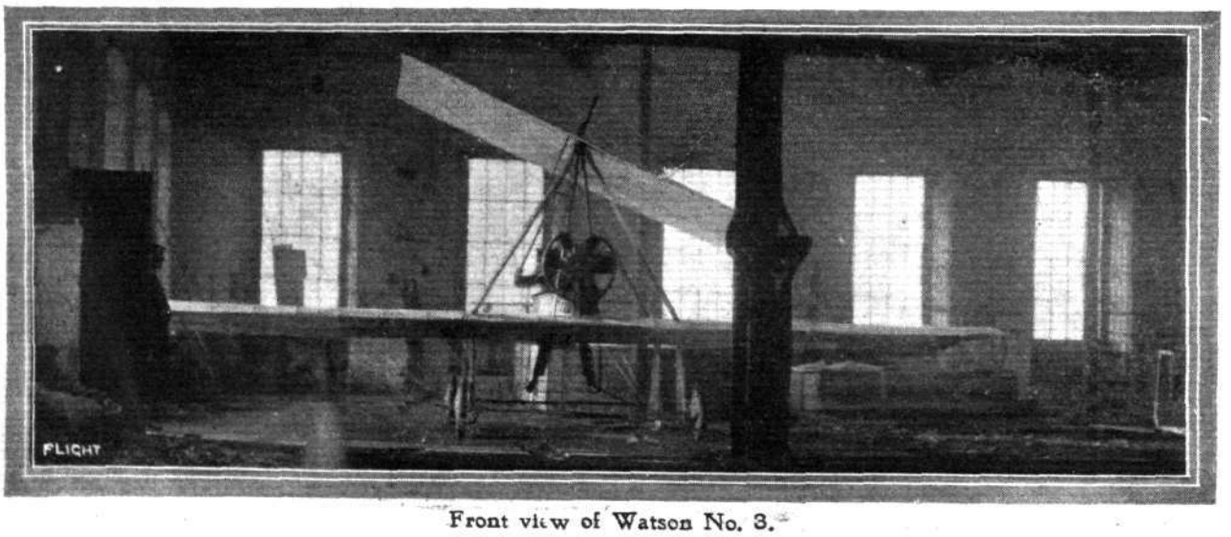
"The machine (No. 3), as will be seen from the accompanying photographs, is of the tractor type, and is driven by a 40 h.p. Anzani engine, mounted in front of the wicker-work *nacelle*. The chassis, which is of the four-wheeled type, is very robust and provides a comparatively wide track. An outrigger formed by two tail booms carries at the rear a monoplane elevator and a small fixed vertical fin. It will be observed that no movable vertical rudder is fitted. Mounted on a very strong *cabane* formed by two pairs of inverted V struts, is the balancing plane, by means of which lateral equilibrium is maintained, and the action of which is explained by Mr. Watson in the following extract:—



Side view of Watson No. 3.

"The method of preserving lateral equilibrium invented by the Wright brothers has been slavishly followed, but this has probably been due to the fact that these gentlemen were the first to fly in a practical way. This does not prove, however, that they have not misled everybody as to the best means of preserving lateral equilibrium. It must be remembered that they began their experiments at Kitty-hawk with the fixed intention of preserving lateral equilibrium by warping the wings, and when this means alone was found insufficient they never considered the possibility of using other means than warping, but looked for an addition to their warping wing machine and devised the vertically pivoted tail.

"The Wright Brothers have stated, and it is well known, that if the angle of incidence of the lower wing is increased, its resistance is also increased, so that the fore and aft axis of the machine turns about its vertical axis, away from the line of flight, and the lower



Front view of Watson No. 3.

wing loses its velocity, unless this is prevented by the movement of a vertically pivoted tail. In the absence of a vertically pivoted tail the loss of velocity of the wing whose angle of incidence is increased, causes it to lose its support, and it descends while the other rises. Thus the vertically pivoted tail is proved to be necessary if lateral equilibrium is to be preserved by the warping of the wings. The absence in a bird of the vertically pivoted tail proves that warping of the wings is not the method employed by a bird to preserve lateral equilibrium.

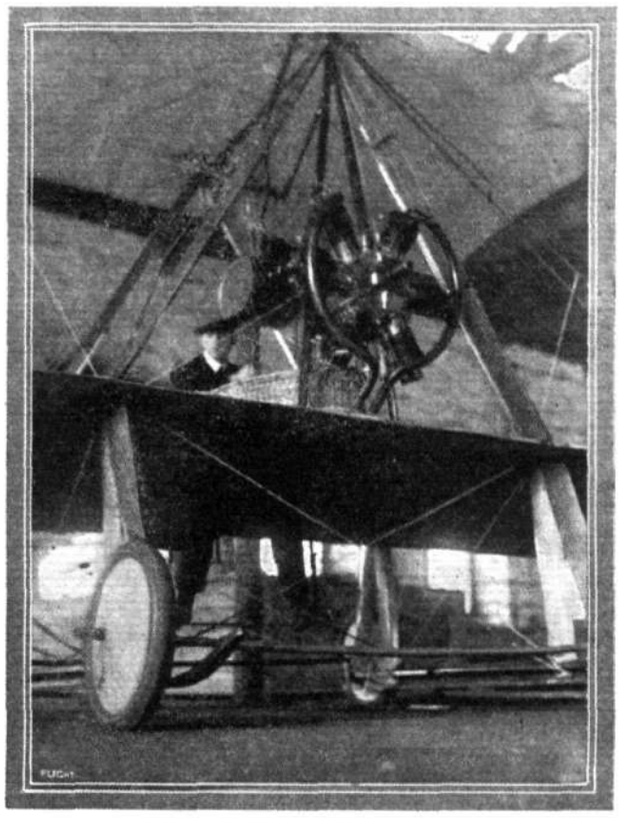
"The method by which a bird preserves its lateral equilibrium, and steers to right or left, is a beautiful method of flight. If a soaring bird is making a straight flight with its wings transversely in the horizontal and it wishes to steer to one side, it rocks its wings about a fore and aft axis by pulling one wing down and allowing the other to rise. It is able to do this because the centre of gravity of a bird is below its centre of support, and a pendulum thus exists. The force which this pendulum exerts if shifted from the natural position in which it hangs, provides a fulcrum in mid-air from which the wings can be rocked. Since the mass of the pendulum is considerable its inertia also helps in providing a fulcrum. When the wings are rocked out of the horizontal their lift has a component force pulling to one side of the line of flight. Now, when a body which is moving in a straight line is acted on by a constant force at right angles thereto, the body describes a circle. Therefore when the bird has rocked its wings it describes a circle.

"It must be remembered that this beautifully balanced flight takes place without any attention on the part of the bird except that it controls the elevation (according to whether it wishes to ascend or descend or fly horizontally during the turn) and rocks its wings to the extent which it considers necessary to make a circle of the desired diameter. In fact the bird possesses a method of flight which takes care of itself and is controlled by two movements. The difficulty which caused Wilbur and Orville Wright to abandon this beautiful method of flight adopted by the bird was that considerable power is required to rock the whole surface of the wings in the manner of the bird.

"A soaring bird has sufficient power to rock the whole wing surface quickly, since it employs for this purpose its strong flying muscles, but the pilot of an aeroplane has not sufficient power for this purpose. Thus the Wright brothers abandoned the perfect method of flight of the bird in favour of warping wings and a vertically pivoted tail, because with this latter method the pilot can preserve lateral equilibrium without having to exert so much power. Less power is required to warp or to control the *ailerons* than to rock the whole wing surface in the manner of a bird. The choice between one or the other of these methods of preserving lateral equilibrium is a choice between the perfect flight of the bird, which, however, has the disadvantage of requiring considerable power on the part of the pilot, and the method of preserving lateral equilibrium by controlling the angle of incidence of the wing tips, or the angle of incidence of the supplementary surfaces, a method which has the advantage of requiring small power on the part of the pilot, but which causes an excess of resistance on the surface which has the greater angle of incidence, and thus necessitates the vertically pivoted tail with its consequent disadvantages.

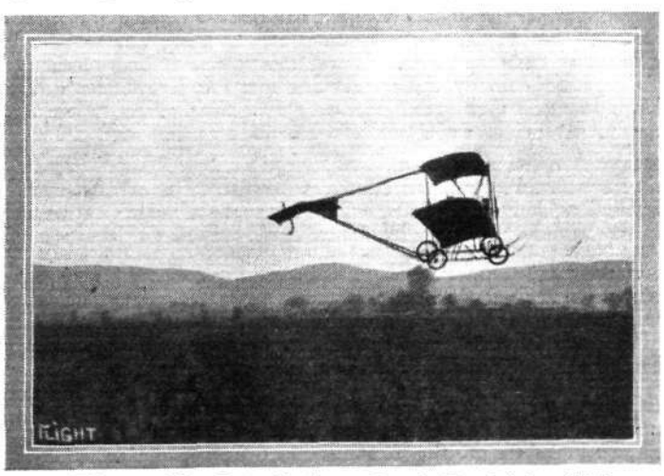
"It remains to examine whether it is not possible to invent a method of preserving lateral equilibrium, which requires small power on the part of the pilot, and which does not increase the resistance of one side of the machine and thus does not necessitate the use of a vertically pivoted movable tail.

"In the machine described, a supplementary aeroplane surface possessing a lifting effect is situated above the main aeroplane, and

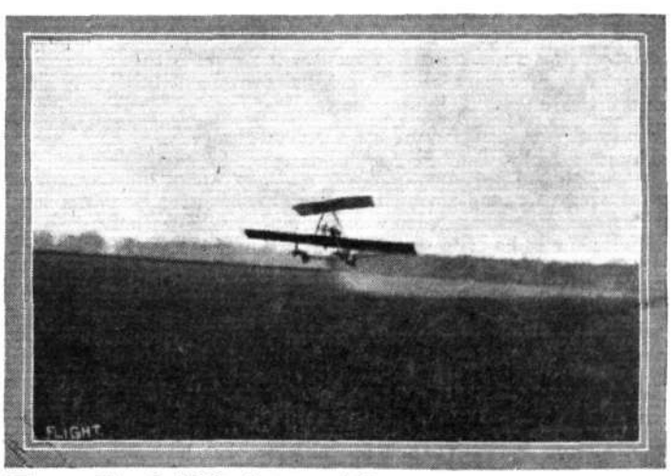


Three-quarter front view of chassis and *nacelle* of the Watson No. 3, showing slots in main planes through which the pilot raises his legs when lying down inside the *nacelle*.

is attached to an upward extension of the frame of the machine. This supplementary surface can be rocked about a fore and aft axis with the exertion of small power on the part of the pilot, and when thus rocked it gives rise to a component side force similar to the side pull of the wings of a bird when they are rocked. This side pull is exerted on the upward extension of the frame of the machine, and thus controls the 'list' of the frame of the machine in the same way as a bird controls its 'list.' The main aeroplane is rigid with the frame, so that the rocking of the upper plane controls the rock of the main plane. The torque about the fore and aft axis of the machine depends on the distance between the centre of gravity of the machine, and the upper part of the upward extension of the frame where the supplementary aeroplane surface is situated. This surface may be of small area, and may still exert a sufficient torque about the fore and aft axis of the machine, if the upward extension of the frame is sufficiently long. It must be remembered that the pressure on the upper rocking wing is always balanced about the axle on which it rocks, so that the rocking does not require great power on the part of the pilot. On the other hand when wings are warped, the wing with the

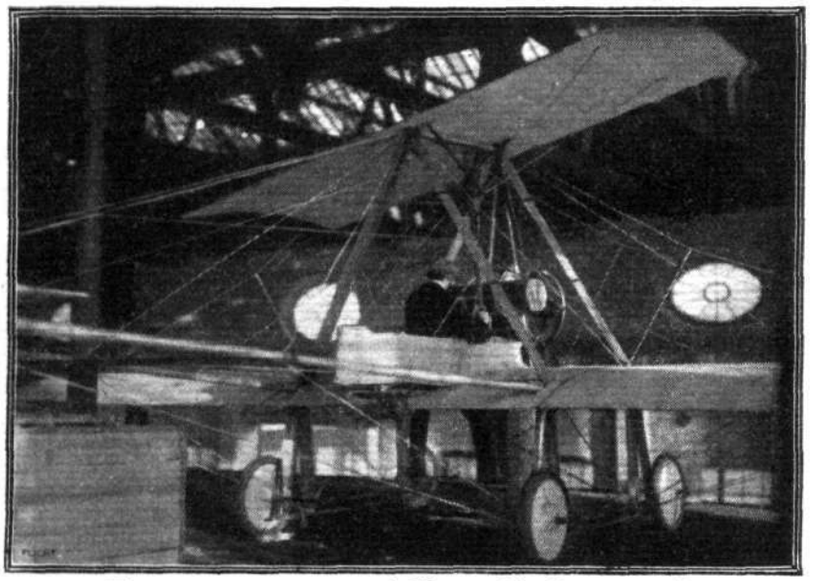


Watson No. 2 in flight at Errol, Perthshire, 1912.



Watson No. 2, 1912, showing balancing plane in operation.

greater angle of incidence has the greater pressure, and considerable power is required on the part of the pilot because of this unbalanced pressure. By placing the supplementary aeroplane surface above the main aeroplane, and in making it to rock about a fore and aft axis, power is obtained with which to rock the main aeroplane surface. This is obtained without introducing any other force than the one required, that is to say the equilibrium of the aeroplane is left unaltered in every respect except that the 'list' is controlled. For instance, the relation between the resistance to the movement of advance, between the upper and lower parts of the machine, is not affected when the upper wing is rocked. When the main plane is rocked out of the 'horizontal' by the action of the supplementary



Three-quarter rear view of Watson No. 3, now at Buc.

plane, the machine makes a circular flight in the same way as a bird makes a circular flight. Thus the pilot can control the 'list,' and can steer to right or left as he desires. The resistance on one side of the machine is not increased when the main plane is rocked by the upper plane, since the main plane and the upper plane have everywhere the same angle of incidence. Thus there is never a tendency of the fore and aft axis of the machine to turn about the vertical axis, away from the line of flight. Therefore no movable vertically pivoted tail is required. Since there is no warping of the wings, and since no vertically pivoted tail is required, movements to create an exact balance between the warp and the vertically pivoted tail are not required. Steering to right and left is caused solely by the rocking of the wings out of 'the horizontal.' Therefore the 'banking' is always just as much as the turn requires. If for any reason the machine acquires a 'list,' the pilot has only to rock the upper wing to correct this list, and if he desires to circle to right or left, again he has only to make one movement, namely, to rock the upper wing; the main plane is then rocked by the upper wing, and the circle is made without requiring any other attention on the part of the pilot, except that he controls the angle of incidence of both the upper and main plane, by means of the elevation rudder so as to make an ascent, a descent or a horizontal flight, taking care not to make a rock of the main plane too great for the power of the engine. If the turn becomes too quick, as may happen because of the tendency of the outer wing to rise and thus to increase the rock of the main plane, the pilot has only to rock the upper plane so that the upper part of the frame is pulled away from the centre of the circle. The main plane thus approaches more nearly to the horizontal and the circle increases in diameter.

"My machine is almost 'fool-proof,' for, as has been shown, only one single movement must be made to preserve lateral equilibrium and to steer. This consists of a transverse movement of the lever. The elevator is controlled by a fore and aft movement of the same lever. The pilot, by rocking the upper plane, gradually rocks the main plane until the circular flight is being made as quickly as he desires, and the turn then takes place without requiring any other attention on the part of the pilot. In fact, this apparatus possesses the advantages of the bird's flight and requires little power on the part of the pilot. The equilibrium is natural compared to the forced equilibrium of the warping wing machine.

"There is another difference between the machine described in the enclosed specification and the machine with warping wings, which is probably *the greatest advantage of all* possessed by the former. This is, that the warping of the wings and the movement of a vertically pivoted tail, because of their indirect action, that is to say because they depend on the speed of advance, preserve their power to restore the equilibrium, only if the aeroplane has sufficient speed to make the warping of the wings and the movement of the vertical tail effective. If the ordinary aeroplane has lost its speed of advance by being made to ascend too quickly, or if it begins to sideslip, no amount of warping of the wings and movement of the vertically pivoted tail will prevent a tendency to capsize laterally, and even in calm weather there is a tendency to capsize laterally if a single propeller is used and the engine is kept running, because of the torque of the engine acting on the machine.

"On the other hand, the machine described in the enclosed specification may be made to preserve its lateral equilibrium, even if it has lost its speed of advance, because of the positive action of the upper plane in preserving lateral equilibrium. Thus if the machine has a 'list' to one side and has lost its speed of advance, so that it begins to descend, the upper wing, when rocked, is caught by the current of air caused by the descent, and the machine is 'righted.' In this case, the upper wing acts almost like a safety parachute, and not only 'rights' the machine but stops the descent."

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Airship Sheds at Farnborough.

IN answer to a question put in the House of Commons last week, Mr. Churchill stated that the airship sheds at Farnborough were only intended to house small airships for training purposes. It was under consideration to remove these sheds to another site, and if this were done it might be found convenient to slightly alter and improve them at the same time.

Hollow Wood in Aeroplane Construction.

IN our issue dated May 2nd, we published a translation of an article that had appeared in *L'Aerophile*, in which the method of hollowing struts and spars on the Farman and other machines was described. This concluded with a comparison between the strength of a hollow and a solid strut, stating how much superior the former is to the latter in its resistance to fracture under bending stresses. It should be noted, however, that whereas in the original article the dimensions are given in millimetres, the modulus of the section has been calculated from centimetre measurements, and that although the conclusions arrived at are, in general, correct, the strut is subject, in practice, to an end loading, and the transverse bending load is of negligible amount.

Blériot Brookland School Starts.

ACTIVE work at the new school which has been organised by the Blériot Co., at Brooklands, will commence on Monday next.

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Gordon-Bennett Eliminating Trials.

FROM the official notices of the Royal Aero Club on p. 514, it will be seen that the eliminating trials to select the team of three to represent Great Britain in the Gordon-Bennett Race, will be held on Salisbury Plain during the last week in August. Each entrant will be allowed to fly three machines, and the programme will include slow and high speed tests over a distance of 200 kiloms. made up of 20 circuits of a 10-kilom. course.

Aviation in New Zealand.

REVERTING to the article which appeared in our issue of May 2nd under the above title, it should have been made clear that the photographs were sent by Mr. A. W. Schaef, who also sent along the details of his own flying and those relating to the smash of Scotland at Newtown Park, Wellington. Incidentally it may be pointed out that only five weeks elapsed between the occurrence of the mishap and the appearance of the particulars in FLIGHT.

It is interesting to learn that Mr. Schaef is now on his way to England, where he intends to secure his pilot's certificate and obtain as much information as possible, first hand, regarding matters aeronautical. Mr. Schaef is sure of a warm welcome in England, especially from those who are acquainted with the work which he has accomplished on the Anzani-engined monoplane which he constructed himself.

FLIGHT

MR. SYDNEY PICKLES AND HIS ACCIDENT.

As our readers will have gathered from FLIGHT, Mr. Sydney Pickles has now practically recovered from the terrible accident which overtook him in September last year, when on a Champel machine he lost control when flying at Hendon with Mrs. Stocks, the very popular aviatress, as passenger. He has found it impossible to keep from aviation, and although he has no intention of coming back into the very active side of flying, he intends, as already announced, to continue flying as an amateur, as and when the inclination takes him, as witness his recent work down at Eastchurch.

This week, when talking over his past work, he gave us a most interesting account of exactly what took place in connection with the deplorable accident, an account of which he had written down in detail on November 23rd last (his medical attendants absolutely refusing to allow him to make any written notes before that date), a few weeks after the accident had occurred, when everything was still vividly in his mind. The details, down to the most minute particular, seemed to have impressed themselves firmly upon his brain, and in view of the many distressing statements which were made at the time of the accident in regard to what Mr. Sydney Pickles did and did not do, and what his intentions were, his present very clear account is of striking interest, and entirely exonerates him from any suggestion of having attempted a risky stunt at an unreasonably low altitude, a suggestion which at the time was, we believe, made in connection with the finish up of his flight. Mr. Pickles' account, as given in his own words, is as follows :—

"About six p.m. on September 20th, 1913, at the London Aerodrome, Hendon, I was asked by Mrs. Stocks to give her a passenger flight with me on the 110 h.p. Anzani-engined Champel biplane. This machine is of the 'pusher' type with an outrigger tail, and the seating accommodation is arranged in front similarly to the well-known Henry Farman machines. Dusk was drawing in, but there was yet ample light left for a short flight. Mrs. Stocks and I climbed on board the machine, and started away from No. 1 pylon, and making in the direction of pylon No. 4. We lifted very quickly, and on reaching the other side of the aerodrome we were up quite a good height. I then flew round pylons Nos. 4, 5, and 6, keeping to the usual course followed in the speed races, and at a height of about 250 ft. Somewhere near No. 6 pylon I turned round and spoke to Mrs. Stocks, saying how glorious the lights of Hendon looked in the distance. As it was beginning to get dark I decided to curtail the flight and land, so I continued along down the middle of the racing course until I was nearly opposite No. 1 pylon. Here I intended to throttle down the motor, and glide down, and also to turn the machine towards a point near No. 4 pylon. This meant a fairly sharp left-hand turn during the glide. Then I intended to cross the aerodrome to somewhere near No. 4 pylon, turn back again, and land.

"Well, I throttled the motor down, and then ruddered over to the left to make the turn. After completing the turn I pressed on the right side of the rudder bar to bring the rudder straight again, and to my unpleasant surprise the bar refused to move. By this time the machine had made a complete circle, and naturally taken a terrific bank owing to the small diameter of the circle. I now instantly resorted to my lateral control in order to reduce the bank, which felt as if it were vertical. This appeared to have a little effect, but the machine still kept spinning and side-slipping. Then, curiously enough, I seemed to realise fully the fate of Paul Beck, in America, and how one person remarked to me that had he switched his motor on he might have saved himself. I thought I was in a similar position to his, so I would try what he apparently did not. I then reached for the throttle lever and opened the throttle wide, at the same time bringing the elevator lever back towards me, as the machine had by now got its nose down. The object of this manœuvre was of course to try and get the nose up. After doing nearly a complete circle with the throttle open I could see no improvement in my position, and, realising that it was increasing my speed towards the ground, I closed the throttle. By this time my machine was in a hopeless position, and I reached forward and turned the switch off, thinking, 'Well, we won't have a fire anyway.' I now fully realised that a smash was inevitable, and then the green megaphone-stand flashed past me, and I realised, much to my astonishment, that I was falling behind this stand, and how near the ground I was, and I pulled the elevator lever right back against my chest as a last effort to flatten out the machine, and also in order to hold my passenger in her seat, and prevent her being thrown out on her head. (I was surprised at falling behind the stand, as when I first lost control I was 300 ft. up, or more, over the flying ground, about halfway between No. 1 pylon and the enclosure. How I got there I cannot explain, except that possibly the rotation of the machine caused a drift, which was perhaps increased when I opened the throttle in my attempt to save the accident.) Then we struck! I distinctly heard the crash, and was momentarily dazed with the shock. When all seemed quiet I opened my eyes, and felt rather surprised at realising that I was still alive. During the whole of the struggle I had had, my anxiety was with my lady passenger, Mrs. Stocks, and I felt sure that we should both 'go out.' The whistling of the wires gave me an idea of the speed at which we were about to strike. As Mrs. Stocks was herself an experienced flyer, the ordeal she must have gone through, sitting there helpless, while the machine was dashing to the ground, must have been terrifying, yet she did not make a sound.

"Then I could hear people's footsteps coming round the machine, and the petrol trickling away from the petrol tank, and I also heard the shouts of 'Put out matches, pipes, cigarettes, &c.' quite distinctly, although I had my eyes closed. I only have a very dim recollection of being lifted out of the machine, but directly they laid me out on the stretcher I felt pain, real pain, in my back. The ambulance men quickly arrived on the scene, and I distinctly heard them pronounce 'Compound fracture right leg.' This I did not feel at all, but in addition to the pain in my back I felt a burning sensation in my body, which turned out afterwards to be caused by a wound 3½ ins. deep. I thought I would make an effort to see, and found it very difficult. I said, 'How is she?' and somebody asked 'Who?' This exasperated me, as I felt irritable. I said, 'My passenger.' They replied, 'She's all right, we gave her something, and she was able to be carried away.' As I lay on my back I felt curious as to the damage done to the machine, so I turned my head to the left and opened my eyes in order to have a look at the machine. I also recollect hearing quite distinctly a person's voice sympathising with me when I complained of pain. One of the sentences was, "Never mind, you'll be all right. I'm your friend, Pickles.' I then said, 'The control wouldn't work,' and a voice answered 'Yes, I know.' I was feeling frightfully exhausted from shock, and thought that should anything happen to me this would be an explanation, however meagre. As I still lay on my back beside the machine I was looking at the irregular row of heads, when everything slowly darkened and went black. I knew I had my eyes open, so I complained about not being able to see. They got me some liquid, which they wanted to put in my mouth, and I asked what it was, because I am a strict teetotaller. (Of course, in a case of emergency such as this I would not have refused it, but I just wanted to know first.) Then the ambulance men lifted me and proceeded to carry me away on the stretcher. Each pace they took gave me terrific pains in my back, which caused me to complain and ask them to take it easily. After a short while we arrived outside the Grahame-White offices, and here they rested a minute. I looked at the many people around me for a familiar face, and soon discovered one. I have since found out that it was Mr. Harry Delacombe. As I was looking up at him he had his head turned away a little, so I proceeded to speak to him, saying, 'Will you do something for me?' and he naturally replied, 'Yes.' I then added, 'I want you to telegraph my mother. The address is Lancaster Court Hotel, Lancaster Gate. Tell her I'm fairly all right—you know.' I was next taken inside the aerodrome hospital to await the return of the motor which had taken Mrs. Stocks to the hospital. I was then taken to the hospital near by, where they proceeded to cut the clothes off my legs, and get me ready for the surgeon, who was coming down from London to perform an immediate operation. I clearly remember my mother coming into the ward to see me before the surgeon arrived. They put me under an anæsthetic for the operation, and I awoke the next day fully realising that I was to be a patient for a long time. As a matter of fact, as I write these lines I am still lying on my back since the accident seven weeks and three days ago, and I am certain the accident was entirely due to my heel becoming fixed between the rudder bar and the flooring of the *fuselage*, with the result that the machine kept turning, and which turning was in all probability aggravated by my opening the throttle.

"By doing the latter very considerable forward impetus was imparted to the machine, and it is possible, as I have already said, that had I left the throttle alone, the smash would have happened in the aerodrome instead of in the enclosure."

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Committee Meeting.

A MEETING of the Committee was held on Tuesday, May 12th, 1914, when there were present:—Col. H. C. L. Holden, C.B., F.R.S., in the Chair, Mr. Griffith Brewer, Major J. D. B. Fulton, C.B., R.F.A., Major F. Lindsay Lloyd, Mr. F. K. McClean, Mr. J. T. C. Moore-Brabazon, Mr. Alec Ogilvie, Mr. C. F. Pollock, Mr. T. O. M. Sopwith, and the Secretary.

New Members.—The following new Members were elected:—Lieut. A. D. Cunningham, R.N., Chave Charles Nainby Luxmoore.

Aviators' Certificates.—The following Aviators' Certificates were granted:—

774 W. R. Ding (Wright Biplane, Beatty School, Hendon). April 27th, 1914.

775 Air Mechanic A. J. Locker (Bristol Biplane, Bristol School, Salisbury Plain). April 28th, 1914.

776 Eric Parker (Grahame-White Biplane, Grahame-White School, Hendon). April 29th, 1914.

777 Lieut. William Annesley Underhill (Worcestershire Regiment), (Vickers Biplane, Vickers School, Brooklands). May 10th, 1914.

778 Robert John MacGeagh Hurst (Vickers Biplane, Vickers School, Brooklands). May 10th, 1914.

779 2nd Lieut. Cuthbert Evan Charles Rabagliati (King's Own Yorkshire L.I.) (Bristol Biplane, Bristol School, Brooklands). May 11th, 1914.

The following Certificate was passed in America:—

Thomas Melville Ross (Curtiss Biplane, San Diego). April 13th, 1914.

The following Certificates were passed in France:—

Charles Ricou (Maurice Farman Biplane, Etampes). April 10th, 1914.

Capt. James Edward Pearce (Maurice Farman Biplane, Etampes). April 21st, 1914.

Accidents Investigation Committee.—On the motion of Col. H. C. L. Holden, the reports on the fatal accidents to Mr. George Lancelot Gipps and Sergeant Eric Norman Deane, R.F.C., were unanimously adopted and ordered to be published in extenso.

(Full Reports will be found following these notices).

Gordon-Bennett Eliminating Trials.—The regulations for these Trials, as drawn up by the Competitions Committee, were approved. It was decided to hold the Trials on Salisbury Plain during the last week in August.

***Daily Mail* Circuit of Great Britain Race, £5,000.**—It was decided to hold this Race during the first fortnight in August, viz., from the 1st to the 15th, and subject to arrangements being made, the starting place will be in the district of Southampton Water.

Aerial Navigation Regulations and Prohibited Areas.—Mr. Griffith Brewer briefly reported on the Conference of the Fédération Aéronautique Internationale, held in Paris on May 5th, 1914. A vote of thanks was passed to Mr. G. Brewer and Mr. J. T. C. Moore-Brabazon for attending as delegates on behalf of the Club.

(A report of the proceedings appears under these Notices).

Suspension of J. G. Gilpatric, American Aviator.—Letter was read from the Fédération Aéronautique Internationale, notifying the suspension of J. G. Gilpatric from April 22nd to August 22nd, 1914, by the Aero Club of America for flying over the City of New York on April 14th, 1914.

Competitions Committee.

A meeting of the Competitions Committee was held on Thursday, May 7th, 1914, when there were present: Col. H. C. L. Holden, C.B., F.R.S., in the Chair, Mr. Ernest C. Bucknall, Mr. Alec Ogilvie, and the Secretary.

Gordon-Bennett Eliminating Trials.—At the invitation of the Committee, the Entrants for the Gordon-Bennett Aviation Race attended as follows:—

Cedric Lee (The Cedric Lee Co.).
Capt. H. Lutwyche (A. V. Roe and Co., Ltd.).
H. White Smith (British and Colonial Aeroplane Co., Ltd.).
T. O. M. Sopwith (Sopwith Aviation Co., Ltd.).
Capt. H. F. Wood (Vickers Ltd.).

It was decided to hold the Eliminating Trials on Salisbury Plain during the last week in August.

Each entrant will be allowed to fly three machines in the Trials, and no machine will be selected unless it has flown in the Trials.

The Trials will consist of (*a*) Slow Speed Test, and (*b*) Speed Test. In the case of the Speed Test it was decided to have this over a course of about 10 kilometres, and to fly the full distance of the Gordon-Bennett Race, viz., 200 kilometres.

***Daily Mail* Circuit of Britain Race. £5,000.**—It was decided to hold this Race during the first fortnight in August, viz., from the 1st to the 15th, and the Secretary was instructed to make arrangements for the starting place and various controls round the coast.

British Empire Michelin Trophy, £800.—The Committee discussed the competition for this year and it was eventually decided to make it a Duration Contest, subject to the approval of the Michelin Tyre Co., Ltd.

Public Safety and Accidents Investigation Committee.

A meeting of the Public Safety and Accidents Investigation Committee was held on Tuesday, May 12th, 1914, when there were present:—Col. H. C. L. Holden, C.B., F.R.S., in the Chair, Mr. A. E. Berriman, Eng.-Lieut. E. F. Briggs, R.N., Major J. D. B. Fulton, C.B., R.F.A., Mr. J. H. Ledeboer, Mr. F. K. McClean, Mr. Alec Ogilvie, Mr. Mervyn O'Gorman, C.B., Major-Gen. R. M. Ruck, C.B., R.E., and the Secretary.

Fatal Accident to Mr. Philippe Marty.—The Committee proceeded to inquire into the fatal accident to Philippe Marty at Hendon on Sunday, April 26th, 1914. Mr. R. T. Gates, Mr. Louis Noel and Dr. A. B. Leakey attended and gave evidence. The report was drawn up and ordered to be submitted to the Executive Committee.

Fatal Accident to Lieut. H. F. Treeby.—The consideration of this accident was resumed and the report was drawn up and ordered to be submitted to the Executive Committee.

Fatal Accident to Capt. C. R. W. Allen, R.F.C., and Lieut. J. E. G. Burroughs, R.F.C.—The Committee resumed its consideration of the various reports of the tests carried out by the National Physical Laboratory.

Death of His Grace the Duke of Argyll.

The Royal Aero Club has received a letter from H.R.H. Princess Louise, thanking the Members for their kind expression of sympathy in her great sorrow.

Daily Mail Circuit of Britain Race, £5,000.

Date of Contest ... ... August 1st to 15th.
Starting Place ... ... Southampton.

Entries.—The Entrance Fee is £100 per aircraft, and entries will be received up to 12 o'clock noon, May 30th, 1914. The Entrance Fee of £100 is payable either in one sum or as follows:—

£50 by noon on May 30th, 1914.
£50 by noon on June 20th, 1914.

Late entries will be received up to 12 noon, June 30th, 1914, in which case the Entry Fee will be £150.

The Entry Form, which must be accompanied by the Entrance Fee, must be sent in to the Secretary, Royal Aero Club, 166, Piccadilly, London, W.

No part of the Entrance Fee is to be received by the *Daily Mail*. All amounts received will be applied towards payment of the expenses of the Royal Aero Club in conducting the competition. Any balance not so expended will be refunded to the entrants.

Full particulars appear in this issue on page 518.

LONDON AERODROME, HENDON.

The Directors of the Grahame-White Aviation Company, Limited, have kindly granted free admission to the London Aerodrome, Hendon, for the remainder of the year 1914, to all Members of the Royal Aero Club on presentation of their Club Membership Card. Motor cars must be paid for.

Aerial Navigation Regulations and Prohibited Areas. Paris Conference.

An Extraordinary Conference of the Fédération Aéronautique Internationale was held in Paris on Tuesday, May 5th, 1914, at which Prince Roland Bonaparte presided. The following countries were represented:—Argentine, Austria, Belgium, France, Germany, Great Britain, Hungary, Italy, Netherlands, Portugal, Russia, Spain, Sweden, Switzerland, and the United States. The Royal Aero Club (Great Britain) was represented by Mr. G. Brewer, Mr. J. T. C. Moore-Brabazon, and Mr. H. E. Perrin. The Governments of France, Holland, and Portugal also sent official delegates.

After discussion, the following statement was drawn up:—

(Translation from French.)

The F.A.I., assembled at an Extraordinary Meeting at the Aero Club de France, May 5th, 1914, to consider what steps should be

taken to procure from Governments the suppression, or, as an alternative, the reduction to an absolute minimum of the areas prohibited to Aerial Navigation,

Being of opinion that it is an easy matter, with the collaboration and on the responsibility of the Sporting Authorities, to prohibit all photographic apparatus on aeroplanes, dirigibles or balloons,

And taking into consideration the very annoying hindrance which the establishment of prohibited areas causes to the development of aerial navigation, which is equivalent as regards aeroplanes and dirigibles to imprisonment in a limited space and as regards spherical balloons, to a veritable sentence of death, it not being possible, in this case, to control direction,

It was Resolved :—

1. That the Governments investigate amongst themselves the possibility of suppressing or reducing the extent of the prohibited areas by limiting to absolute necessity the radius of the prohibited areas round fortified places, which would immediately create a number of free passages, at any altitude.

2. As regards spherical balloons, that every civil pilot of spherical balloons, approved by his National Sporting Authority, be authorised to fly over the prohibited areas at any altitude, and to alight within them in case of necessity.

That there be issued for this purpose an international permit, valid for one year, granted at the request and on the responsibility of the National Sporting Authorities :

As regards aeroplanes and dirigibles :—

That the arrangements resulting from the Franco-German agreement (paragraph 11 Section IV) be extended to all countries of the F.A.I., simplifying, as far as possible, administrative formalities.

Resolved :—

That the Government of the French Republic be asked to call together again the International Diplomatic Conference on Aerial Navigation, in order to regulate in a uniform manner all questions relating to Aerial Navigation.

166, Piccadilly, W. HAROLD E. PERRIN, Secretary.

ACCIDENTS INVESTIGATION COMMITTEE OF THE ROYAL AERO CLUB.

REPORT No. 20.

REPORT ON THE FATAL ACCIDENT TO MR. GEORGE LANCELOT GIPPS, WHEN FLYING AS A PASSENGER WITH MR. FREDERICK WARREN MERRIAM AT LARKHILL, SALISBURY PLAIN, ON MONDAY, JANUARY 26TH, 1914, AT ABOUT 4.45 P.M.

Brief Description of the Accident.—Mr. Frederick Warren Merriam was flying a Bristol monoplane fitted with a 50 h.p. Gnome engine at Larkhill, Salisbury Plain, on Monday, January 26th, 1914, at about 4.45 p.m., with Mr. George Lancelot Gipps as a passenger for an instructional flight. The flight had lasted about five minutes, during which time a circuit had been made at a height of about 80 ft. In making a noticeably flat left-hand turn, the aircraft suddenly banked steeply and, making a quarter-turn, nose dived to the ground from a height of about 50 ft. The pilot, Mr. Merriam, was injured, but the passenger, Mr. Gipps, was killed.

Mr. George Lancelot Gipps was granted his Aviator's Certificate No. 513, on June 13th, 1913, by the Royal Aero Club.

Report.—The Committee sat on Monday, March 30th, 1914, and received the report of the Club's representative, who visited the scene of the accident within a short time of its occurrence. Evidence was also given by eye-witnesses of the accident and by Mr. F. W. Merriam, who was piloting the aircraft at the time of the accident. From the consideration of the evidence, the Committee regards the following facts as clearly established :—

1. The aircraft was built in May, 1912, and completely reconstructed in September, 1913.

2. The pilot and passenger were sitting side by side, and the flight was being made for instructional purposes.

3. The wind at the time of the accident was about 8 to 12 m.p.h.

4. The aircraft was fitted with a dual control giving equal power of control to both pilot and passenger, and without means of disconnecting the passenger's control.

5. Neither the pilot nor the passenger was strapped in, and they were not wearing helmets.

6. The aircraft was not fitted with an engine revolution indicator, air speed meter or banking indicator.

7. The pilot was under the impression that the passenger was resisting his control.

8. The controls were found to be intact after the accident.

Opinion.—The Committee is of opinion that the accident was due primarily to ruddering violently when the aircraft was unbanked, causing it to sideslip outwards, lose way and nose dive. The over-ruddering was due to the action of the passenger in first resisting the control of the pilot and then suddenly yielding.

Recommendation.—The Committee recommends that in all dual controlled machines used for instructional purposes, means should be provided whereby the instructor can instantly disconnect the passenger's control.

ACCIDENTS INVESTIGATION COMMITTEE OF THE ROYAL AERO CLUB.

REPORT No. 21.

REPORT ON THE FATAL ACCIDENT TO SERGT. ERIC NORMAN DEANE, R.F.C., WHEN FLYING AT THE BROOKLANDS AERODROME, WEYBRIDGE, ON WEDNESDAY, APRIL 8TH, 1914, AT ABOUT 7.30 A.M.

Brief Description of the Accident.—Sergt. Eric Norman Deane was flying a Bristol Biplane (Pusher type), fitted with a 50 h.p. Gnome engine, at the Brooklands Aerodrome, Weybridge, on Wednesday, April 8th, 1914, at about 7.30 a.m., and was undergoing the test for his Aviator's Certificate. He had completed the two sets of figures of 8 and alightings in a satisfactory manner and was carrying out the altitude test at the time of the accident. At a height of about 1,000 ft., the pilot commenced a spiral descent at a very steep angle. After descending about 600 ft., and when about 400 ft. from the ground, the pilot fell out of the aircraft and was killed.

Sergt. Eric Norman Deane was a pupil at the School of the British and Colonial Aeroplane Co., Ltd., at Brooklands.

Report.—The Committee sat on Tuesday, April 28th, 1914, and received the report of the Club's representative who witnessed the accident. Eye-witnesses of the accident also attended before the Committee and gave evidence.

From the consideration of the evidence, the Committee regards the following facts as clearly established :—

1. The aircraft was built by the British and Colonial Aeroplane Co., Ltd., in November, 1913, and was of a type in which the pilot sits on the front edge of the lower plane with the engine and propeller behind, and is quite unenclosed.

2. The wind at the time of the accident was about 5 miles per hour.

3. The control wires were found to be intact after the accident.

4. Sergt. Deane had been a pupil at the Bristol School for about six weeks, and during the latter part of the time had made many good flights.

5. The School instructor has stated that in his opinion Sergt. Deane was fully competent to pass the tests for his Aviator's Certificate.

6. The pilot was not strapped into his seat, nor was the aircraft fitted with a safety belt.

7. A spiral descent is not laid down as part of the tests for Aviators' Certificates.

Opinion.—The Committee is of opinion that the accident was due primarily to the pilot forcing the aircraft down at too steep an angle, resulting in his falling forward on his control and accentuating the steepness of the descent.

Recommendation.—In view of the numerous instances which have come before the Committee in which the use of a safety belt might conceivably have either prevented the accident or mitigated the results, the Committee strongly recommends that all aircraft be fitted for and with some form of quick-release safety belt in order that the pilot may avail himself of this safeguard should he wish to do so. In making this recommendation the Committee is fully alive to the objections that have been raised to the use of the safety belt.

Double Fatality at Farnborough.

IT is with the deepest regret that we have to record the catastrophe which occurred at Farnborough on Tuesday last and which cost the lives of Capt. E. V. Anderson and Air-Mechanic Carter. It appears that two Sopwith machines, both belonging to No. 5 Squadron of the Royal Flying Corps, one piloted by Capt. Anderson and the other by Lieut. Wilson, who was accompanied by Air-Mechanic Carter, had been flying at various altitudes for over half an hour when the upper one started to dive at the same time as the other commenced to rise. They collided at a height of about 400 ft. and crashed to the ground on the Alder-hot Golf Links and close to Government House. Capt. Anderson and Air-Mechanic Carter were killed instantly, but Lieut. Wilson had a miraculous escape, and he managed to extricate himself from the wreck before anyone was able to reach the spot. On examination at the hospital it was found that he had sustained a fractured jaw and was severely bruised, but the latest reports state that he is out of danger.

FROM THE BRITISH FLYING GROUNDS.

Royal Aero Club Eastchurch Flying Grounds.

THERE was very little flying last week owing to the state of the weather.

Monday, Tuesday and Wednesday, no flying owing to this.

The following machines were up: No. 16 Avro, 40 Caudron, 31 Henry Farman, 49 B.E., 36 Deperdussin, Comdr. Samson, 10 Short, to Isle of Grain.

Thursday, very windy. Two machines only were up, No. 50 B.E. and 16 Avro.

Friday, very windy. Lieut. Briggs on No. 39 Blériot, returned from Brooklands; 40 Caudron was also up.

Saturday, very windy. Lieut. Briggs on No. 39 Blériot to Sheerness, flying over the Danish Royal Yacht and returning. No. 45 Caudron was also up.

Sunday, very windy and showery. No flying.

Civilian Flying.—Nil.

Brooklands Aerodrome.

OWING to the rain and strong winds (blowing up to 50 miles an hour) no school work was possible during last week. No machines were out on Monday, Tuesday, or Thursday or Friday.

On Wednesday morning, Mr. Barnwell (with a passenger) was flying round a passing balloon on the 100 h.p. Vickers gun 'bus. In the afternoon Mr. Mahl was out on the 80 Sopwith, and Mr. Pixton flew to Farnborough on a Sopwith "scout." Lieut. Collett, R.N., was flying the D.F.W. biplane. (This machine will be fitted with petrol capacity for about 40 gallons to permit of lengthy non-stop flights in the near future.) The 80 Sopwith was again out carrying passengers.

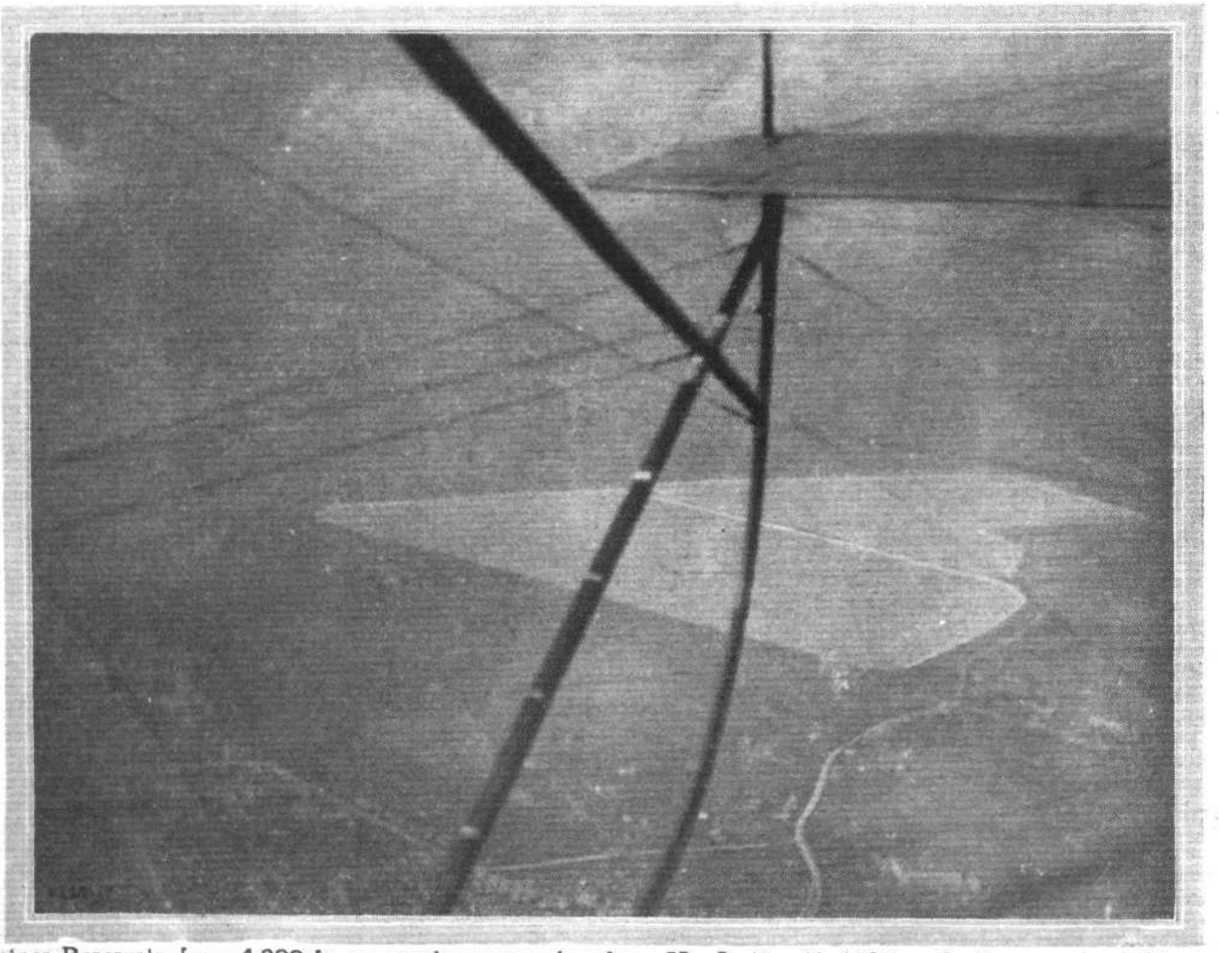
On Friday No. 3 Sopwith "scout" arrived.

On Saturday, Mr. Barnwell carried two passengers on the 100 Vickers gun 'bus, and Mr. Pixton was flying the No. 3 Sopwith "scout."

Bristol School.—Owing to the exceptionally strong winds, no tuition was possible at this school throughout last week, but pupils took advantage of the opportunity to assist in the dismantling and erection of machines, motors, &c.

Vickers School.—School work last week, as everywhere else, was impossible owing to the continued spell of windy weather until Sunday, when Lieut. Underhill and Mr. Liddell made solos

Mr. W. Rowland Ding, who recently took his ticket on a Wright machine at the Beatty School, Hendon, and who afterwards made a successful cross-country flight on the Handley Page biplane at an altitude of 2,000 ft.



Staines Reservoir, from 4,300 ft. up, another snap taken from Mr. J. Alcock's 100 h.p. Sunbeam-engined Maurice Farman.

on biplane. Lieut. Underhill and Mr. Hurst both went for *brevets*, getting through in good style.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Wednesday, last week, Mr. Clarke straights with Instructor Howarth Messrs. Howett, Winter, Gilston-Shepherd and Y. Y. Lui (new pupils), rolling with Instructor Lillywhite.

Shoreham Aerodrome.

Pashley School.—The wind stopped all school work last week except on Tuesday. Mr. Mortimer excellent circuits, Mr. Hale 8's in perfect style; instructor, C. L. Pashley. Eric C. Pashley went up for the first time this year and controlled the machine with his usual excellent style. His turns have lost none of their style.

HONOURING MR. T. O. M. SOPWITH AND MR. HOWARD PIXTON.

AT an informal luncheon given by the Royal Aero Club on Tuesday, this week, to Mr. T. O. M. Sopwith and Mr. Howard Pixton, to celebrate the British victory in the Schneider International Seaplane Race at Monaco, on April 20th, the Marquess of Tullibardine, the Chairman of the Royal Aero Club, presided.

The Marquess of Tullibardine was supported by Brig.-Gen. David Henderson, C.B., D.S.O., Mr. S. F. Edge, President of the Society of Motor Manufacturers and Traders, and Mr. Julian W. Orde, Secretary of the Royal Automobile Club. The following were also present:—Charles Agnew, A. J. A. Wallace Barr, C. Gordon Bell, R. W. B. Billinghurst, Griffith Brewer, Ernest C. Bucknall, John Cates, Harry DelaCombe, Roy DelaCombe, Frank Fisher, R. T. Gates, C. K. Gregson, Charles G. Grey, Lieut. Spenser D. Grey, R.N., C. G. Grunhold, Col. H. C. L. Holden, C.B., F.R.S., B. C. Hucks, Prof. A. K. Huntington, A. A. Dashwood Lang, J. H. Ledeboer, Cedric Lee, Major F. Lindsay Lloyd, Pierre Marechal, O. P. Monckton, W. B. R. Moorhouse, Henry Morris, N. C. Neill, N. Pemberton Billing, N. S. Percival, H. E. Perrin, H. J. Preston, H. R. Preston, Stanley Spooner, J. H. Spottiswoode, B. Stevenson, G. Holt Thomas, C. C. Turner, James Valentine, H. E. Voigt, H. Walter, T. D. Wynn Weston, J. Withers, J. E. Withers.

In giving the toast of "Mr. Sopwith and Mr. Pixton," the Chairman spoke as follows:—

"We are here to congratulate an English constructor and an English pilot on Britain's first international aviation victory on a *British aeroplane*. I refer of course to the splendid performance of Mr. Sopwith and Mr. Pixton in winning the Schneider International Maritime Race at Monaco last month.

"We must not forget that Mr. Grahame-White won England's first international race, the Gordon-Bennett Trophy, in America in 1910 on a French machine.

"True, in the Sopwith machine the motor was French, but we need not grudge this share of the victory to our good friends across the Channel, and it is only fair to recollect how much the Gnome motor has assisted all constructors and pilots in advancing the science and practice of aviation for the past four years. We can only hope that the Government Air Engine Competition now in progress may produce one or more British motors the equal, if not the superior, of anything designed and manufactured abroad.

"Before we heard of Mr. Sopwith as a constructor, he was world-famous as a pilot, first achieving fame by his victory in the Baron de Forest Prize of £4,000 on an all-British Howard Wright Biplane. Soon after he established a reputation in America as one of the world's greatest race-fliers, and gave us a taste of his ability in this direction by his many successes in handicap races at Brooklands, followed by his victory in the first *Daily Mail* Aerial Derby round London.

"For the past eighteen months, however, he has deserted the pilot's seat to devote his whole time to the manufacture of aeroplanes, and combining his practical experience with his engineering knowledge, ranks as one of the foremost aeroplane builders in the world.

"Mr. Sopwith for over two years has told his friends his conviction that biplanes could and would be built to beat any monoplane for speed with the same engine power. Also, that a far greater range of speed and consequently greater climbing efficiency could be attained by biplanes than monoplanes. All these important ideas and expectations he proved in practice at Monaco, when his small biplane, fitted with a 100 h.p. motor, attained a 15-20 per cent. greater speed than any of the French racing monoplanes, even with their 160 h.p. motors. His machine, even with its sea floats, showed a range of speed of about 60 kiloms. to 160 kiloms. The best French monoplanes with larger motors could not do better than from about 90 kiloms. to 135 kiloms.

"As to Mr. Pixton, the pilot, I am told that some of the French people spoke of him as a young and unknown aviator. We all know here in England that Mr. Pixton took up flying in the early days of aviation, and since that time he has justly earned the reputation of being one of England's most capable pilots.

"Mr. Pixton, I understand, had not previously competed in a race of any importance, and had had scarcely any experience in taking pylons. But his ability in this direction proved itself to be equal to that of all the world-famous pilots.

"The greatest of all International Aviation Races has yet to be held this year—namely, the Gordon-Bennett Aviation Trophy. In this race the Club hopes to have three representatives, and, as showing the interest in this event, five of the leading British manufacturers have entered, necessitating the holding of eliminating trials.

"Having carried away from France the most important trophy offered for international hydro-aeroplanes, it is not too much to hope for success in the Gordon-Bennett Race."

Mr. Sopwith, after thanking the Chairman and the guests for the very flattering reception of the toast, gave a highly humorous account of the various little happenings which led up to the ultimate completion of the perfected Sopwith machine which carried off the prize. He also referred in sportsman-like terms to the bad luck of the Frenchmen who competed against him with their Nieuport monoplanes. He acknowledged in very generous terms the great help which the Gnome motor had been to himself in his work, and to the whole of the aviation industry, and he concluded by stating that the building of the Sopwith seaplane which secured the Cup was due largely to the support of the authorities in helping them forward by their orders, and it was that which had enabled them to succeed. The actual machine which secured the trophy was, he said, the direct outcome of a machine built practically to the specifications of General Henderson.

Mr. Sopwith paid a high tribute to the skill of Mr. Pixton, whose flying in the Race drew forth the admiration of the French people at Monaco. He hoped that the British manufacturers would meet with success in the forthcoming Gordon-Bennett Race.

Mr. Pixton also replied briefly in modest terms, attributing largely the win to the excellence of the design of the Sopwith seaplane rather than himself as pilot.

Col. Holden proposed the toast of "The Guests," especially mentioning the name of Brig.-Gen. Henderson, who had done so much for the country in connection with aviation, and had gone as far as it was possible for any man in such an official position, where he was necessarily hedged round with a vast amount of restrictions and red-tapeism.

General Henderson, in replying, congratulated Mr. Sopwith and those concerned with him on the victory, which he hoped and believed very soon would be thought nothing of by reason of our British machines securing so many victories in other directions. From the British engines under test at Farnborough, he thought that there was every prospect of very great further British triumphs in that direction also.

Mr. S. F. Edge, who was also coupled with the toast, was quite convinced that this was only one of a series of big successes in store for the constructors of this country. He was glad to be able to say on behalf of the S.M.M.T. that this year's Aero Show had paid its way. He was very gratified to know that we had succeeded in the interests of Britain in building a machine which had such flexibility as the Sopwith—greater flexibility in speed than any other aeroplane in the world. It was, he thought, the very most important thing to accomplish, the same as in evolving motor cars, a result which he had persistently placed before himself as paramount in his past work in the motor car industry.

A vote of thanks to the Chairman, with a reply from the Marquess of Tullibardine, brought a very pleasant little function to a close.

Montrose Squadron Flying South.

IN order to take part in the combined manœuvres which are to be held on Salisbury Plain next month, 10 machines of No. 2 Squadron of the Royal Flying Corps started from Montrose on Monday morning on their journey south. All machines were B.Es., and the pilots were Capt. Dawes, Capt. Todd, Lieut. Martin, Lieut. Corballis, Lieut. Empson, Capt. Waldron, Lieut. Rodwell, Lieut. Dawes, Lieut. Kelly, and Major Burke. The machines are being followed by transport vehicles (34 in number). With the exception of Major Burke, who had engine trouble, all reached Edinburgh. On Tuesday the whole of the machines reached Berwick, while on Wednesday they all progressed to Blyth.

DAILY MAIL £5,000 PRIZE, 1914.

CIRCUIT OF GREAT BRITAIN.

(Under the Competition Rules of the Royal Aero Club.)

THE FULL REGULATIONS.

THE proprietors of the *Daily Mail* have offered the sum of £5,000 to be awarded to the entrant of the aeroplane which shall first have completed a prescribed circuit round Great Britain in flight within a period not exceeding 72 hours, under the following regulations:—

Regulations.

1. *Date of Contest.*—The competition will open on Saturday, August 1st, 1914, at 6 a.m., and will finish Saturday, August 15th, 1914, at 6 p.m.

2. *Sunday Flying Prohibited.*—There shall be no flying in the Competition between midnight on Saturday and midnight on Sunday, and the period shall not count in the 72 hours.

3. *Qualification of Competitors.*—Both the entrant and pilot or pilots must be British subjects and duly entered on the Competitors' Register of the Royal Aero Club. Pilots must hold an aviator's certificate issued by the Royal Aero Club or other club affiliated to the International Aeronautical Federation.

A passenger must be carried throughout the flights, and the combined weight of the pilot and passenger must be not less than 264 lbs., any deficiency in weight being made up by means of ballast. Pilots and/or passengers may be changed during the contest.

4. *Qualification of Aircraft.*—The complete aircraft and all its parts, including the motor, must have been entirely constructed within the confines of the British Empire, but this provision shall not be held to apply to raw material.

5. *Entries.*—The Entrance Fee is £100 per aircraft, and entries will be received up to 12 o'clock noon, May 30th, 1914. The Entrance Fee of £100 is payable either in one sum or as follows:—

£50 by noon on May 30th, 1914.
£50 by noon on June 20th, 1914.

Late entries will be received up to 12 noon, June 30th, 1914, in which case the Entry Fee will be £150.

The Entry Form, which must be accompanied by the Entrance Fee, must be sent in to the Secretary, Royal Aero Club, 166, Piccadilly, London, W.

No part of the Entrance Fee is to be received by the *Daily Mail*. All amounts received will be applied towards payment of the expenses of the Royal Aero Club in conducting the competition. Any balance not so expended will be refunded to the entrants.

6. *Course.*—The course will be a circuit of Great Britain, with the exception of that part of Scotland north of the Caledonian Canal. Competitors may make the circuit starting in either direction.

7. *Controls.*—The official controls round the course will be announced later. Competitors must alight at each of these controls for purposes of identification.

The aircraft must remain one hour in each control. During the first 30 minutes it must be entirely at the disposal of the officials for examination; the last 30 minutes may be utilised for replenishments and repairs. This period of one hour will not count in the 72 hours.

8. *Starting and Finishing Place.*—The start and finish will be made on Southampton Water.

Competitors will be at liberty to start at 6 a.m. on Saturday, August 1st, 1914, or at any subsequent time and date, provided the complete circuit is accomplished by 6 p.m. on Saturday, August 15th, 1914, within the stipulated 72 hours.

All starts must be made under the supervision of the official of the Royal Aero Club and of the official timekeeper.

There is no restriction as to the number of starts made by a competitor, but in every case the start must be made from the official starting place.

9. *Stoppages.*—Stoppages between the controls are not prohibited, but all alightings must be effected on the sea, an inlet of the sea, an estuary, or a harbour. An alighting on land or inland water will terminate the attempt. (For the purpose of this contest the Caledonian Canal will be considered as the sea.)

10. *Towing.*—Towing is not prohibited, but the finishing line must be crossed in flight.

11. *Repairs.*—Individual replacements and repairs to the aircraft and motor may be made *en route*, but neither may be changed as a whole. The aircraft may be taken ashore for such repairs and replacements. Any time thus spent on repairs will count in the 72 hours.

No repairs or replenishments may be effected during the 30 minutes' allowance for official inspection in controls.

Five parts of the aircraft and five parts of the motor will be stamped or otherwise marked, and at least two marked parts of each of these five must be in place on arrival at each control.

12. *Identification of Aircraft.*—Competitors must have their aircraft completely erected at a place appointed by the Club at Southampton, and must hand them over to the officials for the purposes of being marked. No competitor will be allowed to start until 24 hours have elapsed from the time of so handing over his aircraft. After being originally marked by the officials no fresh parts will be marked.

13. *Time Cards.*—Each competitor before starting will be supplied with a card, which must be handed to and signed by the Club official at each control. A competitor is alone responsible for the safe custody of his card.

14. *Safety Appliances.*—Competitors and their passengers must be equipped with life-belts or other appliances for keeping themselves afloat.

15. *Shed Accommodation.*—Accommodation for the aircraft will be provided at or near the official starting place free to each competitor for one week prior to start of the competition till the closing date.

16. *Examination at Final Control.*—Each aircraft, after passing the finishing line, must, if required by the Club, remain for exhibition and examination for at least 24 hours from the time of arrival.

General.

1. A competitor, by entering, thereby agrees that he is bound by the regulations herein contained or to be hereafter issued in connection with this competition.

2. The interpretation of these regulations or of any to be hereafter issued shall rest entirely with the Royal Aero Club.

3. The competitor shall be solely responsible to the officials for the due observance of these regulations, and shall be the person with whom the officials will deal in respect thereof, or of any other question arising out of this competition.

4. A competitor, by entering, waives any right of action against the Royal Aero Club or the proprietors of the *Daily Mail* for any damages sustained by him in consequence of any act or omission on the part of the officials of the Royal Aero Club or the Proprietors of the *Daily Mail* or their representatives or servants or any fellow competitor.

5. The aircraft shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claim for injury either to himself, or his passenger, or his aircraft, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify the Royal Aero Club and the proprietors of the *Daily Mail* in respect thereof.

6. The Committee of the Royal Aero Club reserves to itself the right to add to, amend or omit any of these rules should it think fit.

Royal Aero Club,
166, Piccadilly, London, W.,
May, 1914.

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Mr. B. C. Hucks at Leicester.

ON Wednesday last week Leicester had its first looping demonstration. Mr. Hucks first indulged in stunts on his two-seater. He has recently developed the famous *chute de côte*, which on a monoplane looks particularly effective. After a punctured tyre had been replaced, Mr. Hucks took up a local undertaker for a flight. The next trip on the same machine was for the height-guessing competition. Mr. Hucks flew straight for Leicester climbing all the way, circled the town and returned to the aerodrome at Old Ayleston, still climbing steadily. On reaching the centre of the ground Mr. Hucks had arranged to fly a small circle, and it was at that point that the height was to be judged. Unfortunately, however, at the very moment that he was about to make the turn he ran into a dark cloud and disappeared entirely from view. It was then agreed to accept estimates of the highest point reached, and the winner of the £5 offered by a local music hall got within 2 feet of the actual figure. Mr. Hucks' new Blériot looper was then brought out for its first flight in public. It had been tried out at Hendon a few days previously, and Mr. Hucks had decided to have the seat moved further forward. He rose very quickly and completed six loops and two upside down flights.

On Thursday Mr. Hucks again flew at Leicester, carrying several passengers on the two-seater and on the looper made six loops.

On the following Saturday a huge crowd witnessed a wonderful display. Three passengers were carried, much fancy flying and *chutes de côte* were indulged in, and seven loops were made on the 50.

FLIGHT

EDDIES.

THE fame of Mr. J. E. B. Thornely, the young Eastbourne pilot, has spread to Germany with good effect, as I learn from his manager, Mr. Roberts, that arrangements have been made for a lengthy tour of the Fatherland, giving exhibitions of looping flights. He will be flying at Mannheim on May 17th, at Frankfort a/M. on May 18th and 19th, and at Münster on the 21st. From there he will proceed to Pforzheim, Hamburg and Bremen, and thence to Hanover and other places. I feel certain that our readers will join me in wishing him good luck on his trip.

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It was a very pleasant surprise to me on Sunday last at Brooklands to see that most indomitable pilot, Gordon Bell, step out of Mr. Sopwith's Rolls-Royce as smiling and cheerful as ever, and, with the exception of a little stiffness, he has now quite got over his mishap on the Cedric Lee machine. The accident, it will be remembered, was caused by a bolt coming adrift, and does not detract from the value of the machine, with which Mr. Bell expresses himself as very pleased.

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From a chatty letter to hand from Mr. George Payne, of Ballarat, Australia, it is evident that Harry Hawker's trip "down under" has created considerable enthusiasm among our Australian cousins. In the case of the local poet this enthusiasm has found vent in the following effort, which I think well entitled to a corner in this page :—

'ARRY 'AWKER.

(After Kipling, behind scratch.)

News Items.—Mr. Harry Hawker, the young Australian airman, made several successful flights at Caulfield in the presence of 30,000 people. During one of his flights he was accompanied by a young lady.

Senator Millen, Minister of Defence, was a passenger with Mr. Hawker in a recent flight over Melbourne.

'E's a boster! 'Arry 'Awker,
'E's a doer, not a talker,
Wot we calls a real corker,
Tho' not rash;
'E cares nothing for a blizzard,
Though it cut him to the gizzard;
In the air he "is"—a "wizard"—
Less the smash.

An' 'e don't use any frillin'
Just to set the people thrillin'
When they pay their bloomin' shillin'
At the show;
But 'e takes things very easy
While 'e sees the engine's greasy,
An' 'e shouts, 'owever breezy,
"Let 'er go!"

An' away 'e goes a-soarin'
While the ladies all adorin'
With us common blokes a-roarin'
In our joy;
An' our praise 'e needn't flout it,
So let everybody shout it,
For there is no doubt about it
'E's the boy!

'An' we 'ear that Mr. Millen
Found that flyin' was so killin'
That no doubt 'e'll now be willin'
Straight away
To give 'im an invitation
To be boss of aviation
For our young Australian nation,
With good pay.

With 'is plane to fly about in
'E'll be just the boy for scoutin'
If the foeman pokes 'is snout in
Doin' wrong.
'E will never prove a balker,
'Ere's good 'ealth to 'Arry 'Awker,
May 'e keep like Johnny Walker—
Goin' strong!

. . . . .

But be wery careful, 'Arry,
While with us you mean to tarry,
Or I'll bet you're bound to marry
Wery soon;
For you'll find yourself a-sighin',
An' the ring you will be buyin',
If you take the ladies flyin'
Near the moon!

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In his letter, Mr. Payne also mentions that Australia is sending us another of her sons, as Mr. Treloar, of Ballarat, is going to England shortly in order to be initiated into the gentle art of flying. I hope that Mr. Treloar will prove as apt at handling the control-lever as are those of his compatriots who have already made a name for themselves in the flying world over here.

T. Elder Hearn, who is better known under his stage name, Tom Hearn, "the lazy juggler," proved last week that, however lazy he may appear on the stage, he is certainly energetic enough when in the air. He obtained his pilot's certificate on a Blériot monoplane at Buc in March last, after a very brief period of tuition; in fact, I understand that he took his ticket after only four hours' actual practice, and last week, whilst waiting to take delivery of a Blériot two-seater monoplane, he persuaded M. Blériot to lend him one of the looping machines, on which he did altogether four loops.

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On Tuesday of last week the two-seater was ready, and "lazy Tom" decided to make a start for his flight to England, in spite of the very rough weather. Leaving Buc he set his course for Abbeville, but the wind proved stronger than anticipated, and so when he had to come down after fighting the elements for 2 hrs. 40 mins., during which time he encountered several rainstorms, he found himself, not at Abbeville, but at Amiens. Fortunately a military aviation camp was close at hand, and a hangar was placed at his disposal. At 3 o'clock on Wednesday he left Amiens and flew to Folkestone, *via* Boulogne Landing at Folkestone about 6 o'clock, after taking nearly an hour to cross the Channel, he had half an hour's rest and then started again, with the intention of flying on to Hendon. The weather was still very rough, and, running out of oil, he had to descend at Gillingham, near Chatham. Here he succeeded in obtaining a sufficient supply of castor oil from a local chemist (strangely enough at a lower price than that asked for the precious fluid at the dealers'), but darkness prevented flying any farther that day. Another start was made on Thursday morning at 6.30, but as there was a ground mist which prevented him from getting his bearings, Mr. Hearn had to come down at Hounslow Heath. In landing he buckled a wheel, and so the machine was *hors de combat* until a spare wheel could be obtained. As luck would have it there was an empty hangar on Hounslow Heath in which he got permission to house his machine. At the first favourable opportunity Mr. Hearn hopes to continue his aerial journey to his destination, Bradford.

To have persevered with his flight under such unfavourable conditions and with so little experience was perhaps a little imprudent, as Mr. Hearn himself admits, but at any rate it shows that he is a "sticker," and if he will persevere in the same way in the future he will doubtless soon gain the necessary experience which goes to the making of a good pilot.

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I should think that Frank Goodden, the well-known pilot of the Caudron biplane, who has now joined the Grahame-White Aviation Co., can claim the distinction of being the first to kick a man out of an aeroplane from a height of 2,000 ft. I hasten to explain however, that Goodden didn't do it out of spite to a rival parachutist, but in order to help him clear the wires of the Grahame-White biplane from which the "kickee," Mr. W. Newell, made a parachute descent on the evening of Saturday last.

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Several of the new machines which were seen at Olympia are either tried or about to be tried very shortly. The new Grahame-White 100 h.p. biplane has already been taken up for a few trial flights, with Louis Noel at

the helm, and has proved very fast. A few minor alterations have suggested themselves during these trial flights, and as soon as they have been carried out the machine will make its public appearance. The little Avro scouting biplane would have been finished and tried by now, had it not been for the fact that the firm has been so busy in other directions that they have not had time to give it a few finishing touches. I am informed, however, that it will be put through its tests at Brooklands very shortly. The Hamble River seaplane, which was shown incomplete at Olympia, is having its chassis redesigned, and a few other alterations made. It will in all probability be tried by Mr. Gordon England.

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As noted in FLIGHT recently, the aerodrome of M. Blériot at Buc, since the commencement of "looping," has become a most popular Sunday afternoon rendezvous for Parisians, and it has led to the organisation of races, after the style of the meetings at Hendon. Among the most popular items in the programmes are the races with taxying *pingouins* around the pylons. In view of the eccentric gyrations of pupils when they first begin their rolling practice, a race of this sort might provide quite a lot of amusement if introduced at our own aerodromes. Another "gymkhana" event which has been successfully tried in France is to send up miniature balloons from the windward side of the aerodrome and then despatch several pilots on their various types of machines in pursuit of them. This I am told provides quite a lot of sport, and some of the pilots succeed in destroying several of the balloons. Hendon please note!

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They are telling a rather amusing story down at Brooklands. A pupil was going out on one of the biplanes and was heading for the river. He just managed to get the machine off the ground about three inches before reaching the bank, and in doing a left-hand turn in order to bring the machine back over the solid ground he forgot to use his *ailerons*, with the result that the machine side-slipped outwards. Suddenly he seemed to remember that there was something he had to do, and looking about him he caught sight of the *aileron* cables. Letting go of his control lever with both hands he leaned out to the right and caught hold of the *aileron* cable and proceeded to haul it in as though it were one of the sheets of the stay-sail of a boat. The machine promptly banked and continued on a left-hand turn. Within a few seconds he flattened out, but, finding himself now over the sewage farm, the performance was repeated, after which he managed to land safely.

"ÆOLUS."

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The Aerial Derby.

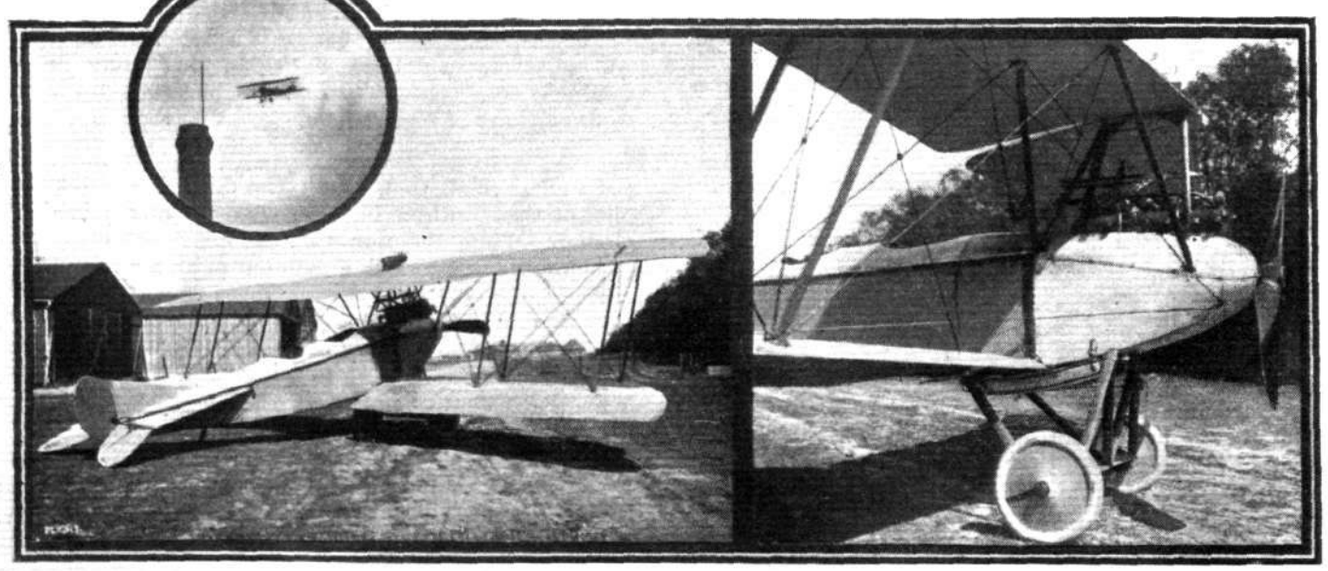
ALTHOUGH the entry list does not close until Monday next, fourteen machines have already been entered to take part in the Aerial Derby round London, which is to take place on Saturday, May 23rd. They include Gustav Hamel and F. Goodden on Moranes, R. H. Barnwell on a Vickers biplane, S. V. Sippe and H. Busteed on Bristols, P. Verrier on a H. Farman, R. H. Carr and Louis Noel on Grahame-Whites, C. H. Pixton and another pilot on Sopwiths, L. Strange on a Blériot, V. Waterfall on a Martinsyde, H. Blackburn on an Avro, and Jack Alcock on a M. Farman. It is expected that several other well-known British and foreign pilots will take part, and that there will be at least twenty machines flying in the contest. As we have before mentioned, the course will be the same 95-mile circuit, starting from and finishing at Hendon, as was used last year, the turning points being at Kempton Park, Epsom, West Thurrock, Epping and Hertford. The machines will be despatched from Hendon at one minute intervals, the first leaving about 4.15 p.m. Extra accommodation is being provided in the enclosures at Hendon Aerodrome, from which, if the day is clear, the leading pilot will first be discerned when he is about five miles away. The prizes for the race are the *Daily Mail* Gold Cup, the "Shell" £250 for the fastest time, the "Shell" trophy and prize of £100 for the winner of the sealed handicap, £75 to the second, and £25 to the third.

Daily Mail Circuit of Britain.

THE actual date of the Circuit of Britain for the *Daily Mail* prize of £5,000 has now been settled. The competition will open at 6 a.m. on Saturday, August 1st, and the start may be made at any subsequent time and date provided the circuit is completed by 6 a.m. on Saturday, August 15th, within the maximum time allowed of 72 hours. The start and finish will be on Southampton Water. The full rules will be found on p. 518.

An Anzani for Shanghai.

As a further sign of the world-wide activities of the General Aviation Contractors, Ltd., of 30, Regent Street, S.W., it may be mentioned that they are this week sending to Shanghai a 35 h.p. Y Anzani engine, together with a Rapid propeller with metal sheaths, propeller shafting, transmission gear, and special starting device, an installation which will be used on a propeller-driven hydroplane with which it is proposed to navigate some of the Chinese rivers.



Two views of the 150 h.p. D.F.W. fast reconnaissance type biplane. Inset, the same machine in flight.

FLIGHT

THE MEASUREMENT OF AIR SPEED.

By A. P. THURSTON, D.Sc., F.R.Met.S., Associate Fellow Ae.S.

(*Concluded from page 499.*)

THE Clift and Ogilvie air-speed indicators are described in detail because they have proved their worth and deserve to be better known. They are elastic diaphragm instruments belonging to class (*f*). Instruments of this type utilise the hydraulic or Brahmah Press principle for increasing the magnitude of a force. They consist of two parts, a pressure head and a diaphragm recording device. The Pitot tube is connected with one side of the diaphragm and the static tube with the other. The force due to the difference of pressure between the Pitot and the static tubes is multiplied by the ratio of the diameters of the diaphragm and the Pitot tube. A powerful force may therefore be obtained for operating the indicating device.

Clift Air-Speed Indicator.—This instrument is shown in Figs. 3 and 4. The "head," which is shown in Fig. 3, consists of the usual Pitot tube and a static tube provided with a conical cap to increase the suction in the lateral holes in the tube under the cap. A disc of the same diameter as the base of the cone is mounted on the tube so as to leave an annular opening communicating with the lateral holes. The indicating instrument contains a cylindrical chamber divided into two parts by a very light flexible diaphragm of specially prepared leather. This diaphragm, which weighs about $\frac{1}{32}$ oz., carries at its centre a small aluminium disc fitted with a central boss. This boss contacts with a collar on a light spindle which is guided on both sides of the diaphragm. The upper or dial end of this spindle presses against the free end of a triangle cantilever or leaf spring. The dynamic and static tubes of the "head" are connected by tubing to opposite sides of the diaphragm. Any difference of pressure between the two sides of the diaphragm is therefore transferred through the spindle to the cantilever spring, which is thereby deflected. The movement of the spring is transmitted by a rocking lever having an adjustable radius arm in contact with the spring to a multiplying mechanism, such as is used in aneroid barometers, whereby a hand or indicator is given a rotary movement over a dial which may be graduated to read either pressure or velocity. The multiplying mechanism consists of a rocking quadrant rack, which is provided with a slot engaged by a pin projecting from the rocking lever and meshes with a pinion on the spindle carrying the hand. A spiral or hair spring normally restores the hand to the zero position. The instruments are graduated individually in the works for various air pressures, which are read by a delicate tilting water gauge capable of reading to within 0·002 ins. of water. The velocity is given by the equation $v = 57{\cdot}7\sqrt{h}$.

Where v = velocity in feet per sec. and h = corresponding difference of level in water gauge in inches.

The width of the annular gap has been found to affect the constant in the above equation, but as great care is taken in adjusting this width the variation of this constant is negligible with the instruments placed on the market. These instruments have been tested between considerable ranges of temperature with satisfactory results. The inertia of the moving parts is so small that the readings do not appear to be affected by rapid changes of velocity. In conducting an exhaustive test of any instrument the ascending and descending readings should be plotted against the true readings. Any lag due to friction of the parts, fatigue, or to hysteresis is thereby revealed. This has been done for Clift's air-speed indicator, and the results are plotted in Fig. 5. The maximum difference between ascending and descending readings is 3 per cent., or $1\frac{1}{2}$ per cent. on either side of the mean. As, however, the greater accuracy, in flying machine work, is obviously required on the descending scale, the instrument is graduated so that the maximum error on this scale does not exceed $\frac{1}{4}$ mile per hour.

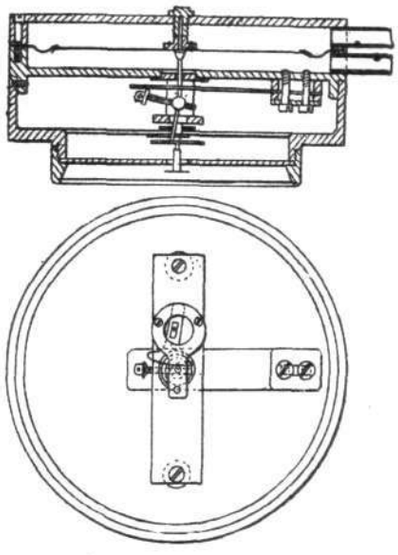


Fig. 4.—Sectional elevation and plan of Clift's air-speed indicator.

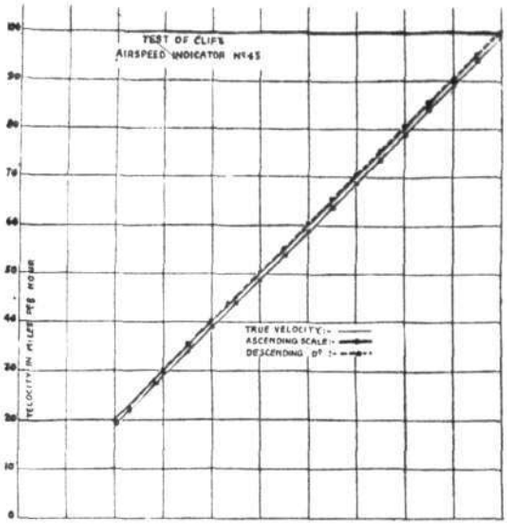
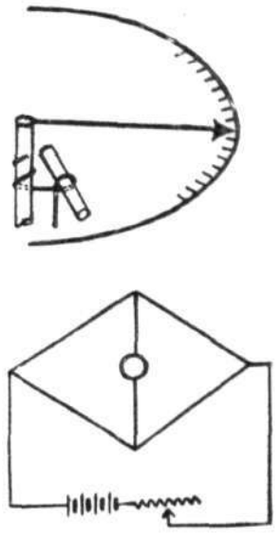


Fig. 5.—Chart showing test of the Clift air-speed indicator.



Figs. 7 and 8.—Above is a diagram of the indicator mechanism of the Ogilvie air-speed indicator, and below, a diagram of the Morris air-speed indicator.

The Ogilvie Air-Speed Indicator.—This instrument is shown in Figs. 6 and 7. Fig. 6 is a photograph of the instrument used by Messrs. McLean and Ogilvie in their successful flight up the Nile to Khartoum. The Ogilvie air-speed indicator is characterised by extreme simplicity. A cylindrical chamber is divided into two parts by a stretched indiarubber diaphragm. The indicating hand is carried by a stout spindle which is pivotally mounted in the centre of a light metal frame bridging across the centre of the upper chamber. A second stout spindle is pivoted in close proximity to the first spindle and with its axis at right angles to it. These spindles act as drums or rollers to a thin silk or other thread, one end of which is connected to the centre of the diaphragm. This thread (see Fig. 9) passes upwards between the spindles and over the second spindle to the lower end of the indicator spindle. It then makes two ascending anti-clockwise turns on the first spindle and its end is connected thereto. The head is of the usual combined

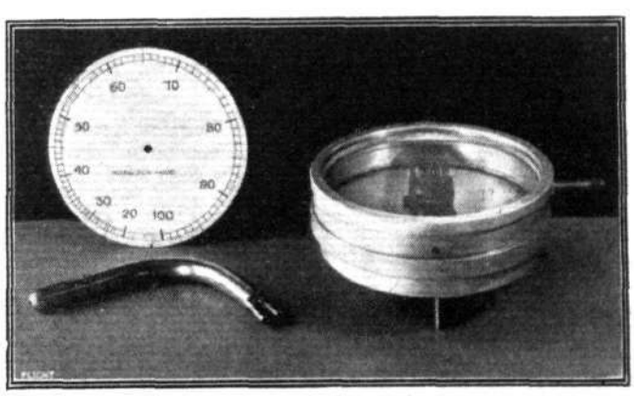


Fig. 6.—Head and details of Ogilvie's air-speed indicator.

concentric dynamical and statical tube type, and its "constant" is stated to be unity. The dynamical tube is connected to the upper chamber and the statical tube to the lower chamber. A difference of pressure between the two sides of the diaphragm causes a pull to be exerted on the thin thread which rotates the spindles against the action of a spiral or hair spring mounted on the indicating spindle. The deflection varies with the difference of pressure, and the dial is graduated in terms of the corresponding velocity. The scale, so obtained, is an "open" one between velocities of 20 and 100 miles per hour.

Hysteresis in the rubber diaphragm, causing the readings on an ascending and descending scale to differ from the true reading, is largely obviated by placing the diaphragm under an initial tension. The instrument has been tested between the limits of 30° below zero and the heat of a tropical sun, and has given satisfactory readings. There appears to be no fear that the indiarubber diaphragm will rapidly perish. Instruments which have been in use for nearly a year show no signs of deterioration. The sensitiveness of the instrument depends of course on the sizes of the piping and head. Usually $\frac{5}{16}$-in. × 24 gauge is used on biplanes and $\frac{1}{4}$-in. × 24 gauge on monoplanes. The head shown in the photograph has a restricted nozzle, but even with this, Mr. Ogilvie says that he saw the hand jump in half a second from 55 to 69 miles an hour during a bad gust in the Sudan.

Instruments of the Clift or Ogilvie type should on no account be blown into, as the zero of the instrument may be thereby upset or the indicating mechanism damaged.

pv Instruments.—(2) This type, which has been left to the last, will be illustrated in detail by a device developed at East London College by my friend and colleague, Prof. Morris. His device has proved itself so convenient in use, and so sensitive and acccurate in recording changes of velocity, that it can be commended to members of this Society for laboratory work. The device can be converted into a pv^2 instrument for acting as a dynamical buoyancy meter, but it is not proposed to discuss that question to-night. Instruments of the pv type consist of two parts, one part being engaged by the air and the other being connected to the first part so as to indicate the change produced in it by the current of air. The electrical resistance of a wire varies as the temperature, and various materials have different temperature-coefficients. This is shown by the following table taken from Prof. Morris's paper* which was read before the British Association at Dundee, 1912:—

Material.	Melting Point. Approximate. Deg. Cent.	Electrical Resistance. Temperature Coefficient. Per cent. per Deg. Cent.
Iron	1,505	0·62
Copper... ...	1,062	0·428
Nickel	1,450	0·27 commercial 0·62 electrolytic
Tantalum ...	2,910	0·33
Platinum ...	1,730	0·38
Tungsten ...	2,950	0·51

It will be noticed that iron and electrolytically deposited nickel have the highest temperature coefficients. (Any impurity in the nickel causes a big drop in the temperature coefficient.) If, therefore, an electrically heated wire is placed in an air current its temperature will be lowered and its electrical resistance increased by the cooling effect of the air.

The following principles may be used:—

(1) The potential across the wire being maintained constant, the current flowing in the wire will give a measure of the velocity.

(2) The resistance, and therefore the temperature, being kept constant, the current will also give a measure of the air velocity.

The laws connecting radiation and velocity have been thoroughly investigated by A. E. Kennelly, C. A. Wright and J. S. Van Bylevelt, and their results are published in a paper on "The Convection of Heat from Small Copper Wires." (*Transactions of the American Institute of Electrical Engineers*, Vol. XXVIII, Pt. 1, 1909.) These experimenters found that

(1) The linear convection is proportional to the temperature elevation of the wire.

(2) Between 4·5 and 45 miles per hour the linear convection increases as the square root of the wind velocity.

Prof. Morris found that the most convenient apparatus consisted of a simple Wheatstone bridge made with alternate arms of a material having a high temperature coefficient and the remaining arms of manganin, the electrical resistance of which is practically independent of the temperature. The arrangement is shown in the diagram, Fig. 8. The potential across the bridge was maintained constant. This arrangement corresponds to the first principle enunciated above, and therefore the value of the current gives a measure of the air velocity. The sensitive arms of the bridge in one case were formed of thin platinum wire of No. 40 S.W.G. and 2·62 ins. long, and the constant arms of 6 inch lengths of manganin wire of No. 30 S.W.G. This bridge could be brought into balance in still air by passing a current of 1·4 ampères through it, which gave a temperature rise of about 85° Cent. in the bridge. The battery consisted of a two-volt accumulator, and the millivoltmeter was a "Record" 50 ampère moving coil instrument with its shunt removed.

In another type of bridge, which is independent of the temperature of the air current, the arms consist of four iron wires, the alternate wires being shielded in tubes to form the constant approximately arms of the bridge and the exposed wires forming the sensitive arms.

This apparatus is very useful in exploring the velocity of air flow around a body. It responds rapidly to changes in velocity, and at the same time is perfectly dead-beat, and it lends itself to giving large scale indications. The velocity is read directly on the instrument and the direction is recorded by projecting the image of a vane pivoted on the sensitive wire on to a screen.

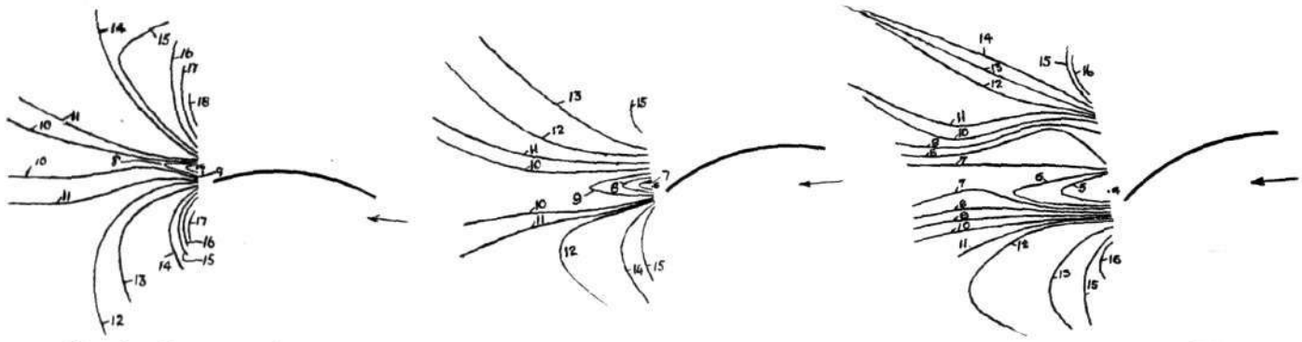


Fig. 9.—Contour velocity lines in the wake of an aerocurve. A – at 0°; B – at + 10°; and C – at + 20°.

In many cases where vertical fans, rudders, or horizontal elevators are placed in the "wake" or shadow of other bodies or planes, the results obtained may be very different from that calculated owing to the wake effect. The author has, on previous occasions and in various ways, pointed out the effect of the wake as regards stability and control. This instrument provides another means of investigating its effect.

The last diagrams, Fig. 9, show the contour velocity lines in the wake of an aerocurve having a camber of 1-10 of the span and set at angles of 0°, 10° and 20°. It was previously used by the author for determining the distribution of pressure on inclined aerocurves, and described in a paper read before the British Association, Dundee, 1912.* It is aerocurve No. 2 in that paper, and has a span of 2·42 inches. The numerals indicate the velocity in miles per hour. A section of the aerocurve is shown in position in all the figures set at the true inclination. All the curves show in a graphic way the shadow cast by the aerocurve. It is obvious that fins or rudders placed in this shadow would not be as "efficient" in action as corresponding ones in a clear run of air. The velocity in the immediate wake increases with the distance behind the rear of the aerocurve, but the maximum intensity of shadow appears to remain approximately in a horizontal line.

In conclusion, the author wishes to thank most sincerely Prof. J. T. Morris, M.I.E.E., and Messrs. E. H. Clift, A.F.Ae.S., F. K. McLean, A.F.Ae.S., and A. Ogilvie, F.Ae.S., for very kindly lending apparatus and supplying information. He would also record his great indebtedness to Mr. B. G. Cooper, A.F.Ae.S., for valuable as istance in obtaining information and apparatus.

* *Engineering*, December 27th, 1912.

* *Engineering*, September 20th, 1912.

FLIGHT

THE FLYING MACHINE FROM AN ENGINEERING STANDPOINT.*

By FREDERICK WILLIAM LANCHESTER, M.Inst.C.E.

1. *The Air Considered as the Permanent Way.*—In approaching the subject of the flying-machine from the engineering standpoint, it is desirable to devote attention in the first instance to the air considered as the "permanent way." When the atmosphere is quiescent a gliding model or a flying-machine carves its way through the air in rectilinear flight as if supported on a perfectly-laid track—a far more perfectly laid track than the railway engineer has hitherto shown himself able to lay down. Under such conditions the Aeronautical constructor requires to know the weight and coefficient of traction of the machine, the velocity of flight, and the maximum gradient it is required to climb, the problem then resolving itself into the provision of a screw-propeller of sufficient

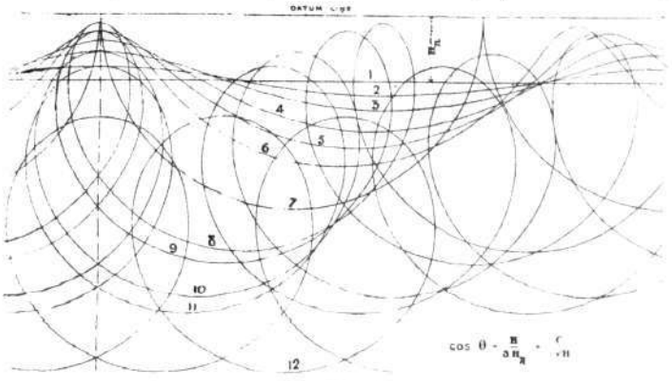


Fig 1.

diameter and appropriate pitch to supply the necessary thrust-reaction, and the fitting of a motive-power engine (and, if necessary gearing) to drive the said propeller at its correct speed. The horse-power needed is calculated just as in any other case of propulsion or traction. In addition, the engineer needs to be able to calculate the stresses necessary to the design of his aerofoil and *fuselage* structure, and to design a suitable alighting chassis. For the present we shall assume that we have to deal with a machine in being, and devote our attention to the peculiarities and properties of the aerial highway to which the machine has to be adapted and to adapt itself. In Fig. 1 is represented the flight-path† of a hypothetical machine, plotted from a mathematical equation. The hypothetical machine differs from an actual flying-machine, or glider, inasmuch as it is assumed to be quite small in comparison to the minimum radius of curvature of its flight-path, its whole mass is taken as concentrated at its centre of gravity (consequently it has no moment of inertia about its transverse axis), and it is presumed to experience no resistance in flight, or, alternatively, it is supposed to have a propelling force constantly applied equal at every instant to its resistance. Referring to Fig. 1, it is seen that the straight line flight-path is represented by a horizontal line, path No. 1; here the velocity of the machine is equal to that acquired by a body falling freely through a distance H_n constituting the distance between flight-path No. 1 and the datum line. For this hypothetical machine there is an infinite number of other possible flight-paths, the whole series being represented by the equation

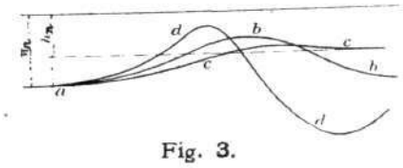


Fig. 3.

$\cos\theta = \frac{H}{3H_n} + \frac{C}{\sqrt{H}}$, from which the samples given are plotted.

It will be seen that the series comprises two notable special cases. Firstly, we have the straight line path No. 1; secondly, the exact semi-circle No. 7.

The flight paths, or "phugoids" Nos. 1 to 6, of less amplitude than the semicircle, are those which are of chief concern from our present point of view, the cases beyond the semicircle, in which the curve has no point of inflection, and in which the machine "loops the loop," are in the main only interesting from the point of view of the mathematician and the student of "trick-flying." These inflected curves have been more fully plotted in Fig. 2. In both Figs. 1 and 2 the velocity at any point is that corresponding to a body falling freely from the datum line. Thus, given the normal or natural flight velocity V_n, the scale of the chart is determined by the calculation of H_n from the equation of the falling body $H_n = V_n^2 \div 2g$.

Although, as already stated, the flight-paths given in Figs. 1 and 2 represent, strictly speaking, a hypothetical machine that only faintly resembles an actual machine, the difference has but little effect on the validity of these flight-path charts. I have shown (see *Aerial Flight*, vol. ii, §§52 *et seq.*) that in the main the effect of moment of inertia about the transverse axis is to cause the amplitude of the oscillation to increase, so that the machine, or glider, will pass by imperceptible stages from one curve to another in the order they

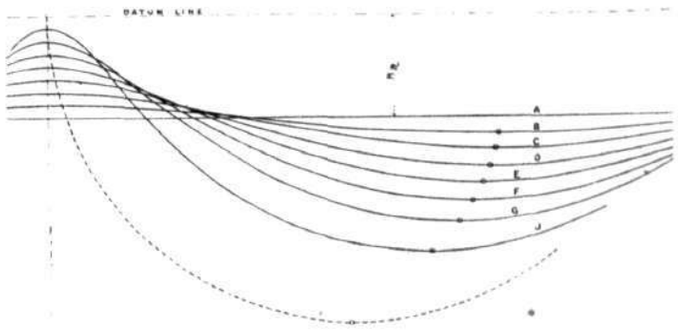


Fig. 2.

are numbered on the chart, eventually leading to instability. I have also demonstrated that the assumption of a constant horizontal propulsive force, in place of a force always in equilibrium with the resistance, has the reverse effect, and tends to damp out an oscillation and diminish the path amplitude. We may thus in any free flight model, or glider, have the flight-path unstable, neutral, or stable,* according to which (if either) influence predominates. In an actual flying machine we may also have the flight-path unstable, neutral, or stable, but here experience has shown that a skilled pilot is well able to handle a machine even though its natural flight-path may be unstable; in spite of this, calculation shows that, speaking generally, machines as flown to-day are not far, one way or the other, from the neutral state. From the engineer's point of view it is unimportant whether the flight-path stability is inherent in the machine, or whether, so to speak, the finishing touches have to be given by the pilot himself.

The point I wish to make clear at the present juncture is that the curves, plotted from a mathematical equation, do actually apply with reasonable experimental exactitude to models and to machines in flight. Thus, a disturbance acting on any model in free flight will set up periodic undulations in the flight-path, and these have within the limits of experimental observation both the time period

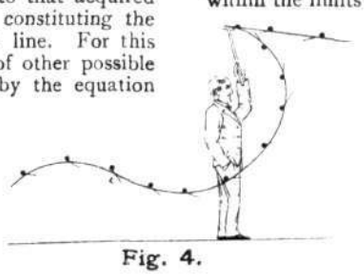


Fig. 4.

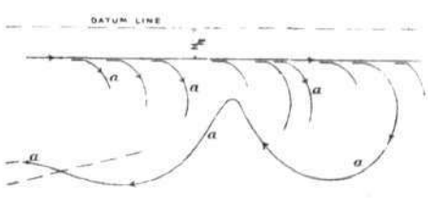


Fig. 5.

and phase length corresponding to their theoretical values in relation to the flight velocity. Some experimental determinations (*see Aerial Flight*, vol. ii, §§ 69), showing the reality of this relation made with models in free flight, are given in Table I.

TABLE I.

		1.	2.	3.
Flight velocity		14·0	14·0	10·0
Theoretical phase length ...	feet	27·0	27·0	15·5
Measured ,, ...	feet	26·0	—	—
Theoretical time period ...	second	1·93	1·93	1·55
Measured ,, ...	second	1·9	1·83	1·37

The phugoid, or flight-path chart is capable of useful application

* Paper read before the Institution of Civil Engineers on May 5th.

† Reproduced from Fig. 42 of *Aerial Flight*, by F. W. Lanchester, vol. ii

* This kind of stability is frequently termed *dynamic stability*.

in more ways than one. Any movement of the tail plane or "elevator," for example, by altering the attitude of the main aerofoil causes the machine to become self-supporting at a lower or higher velocity, that is to say, alters its natural velocity, and we thus may represent such a change in the manner indicated in Fig. 3. Here a machine is presumed flying at a certain velocity corresponding to the height H_n, its elevator at the point a is altered to correspond to a lower flight velocity corresponding to a height, h_n; this is equivalent to altering the scale of the chart at that point, and the subsequent path of the machine is represented by the phugoid curve $a\ b$. This path may undergo damping, either due to the inherent stability of the flight-path or due to the intervention of the pilot, as shown by the line $a\ c$. In the case of a model of unstable flight-path with no intervention from the pilot, the flight-path becomes one of augmented amplitude, $a\ d$.

When a machine is fitted with an elevator (or adjustable tailplane) of large surface, it is possible for the pilot to take such entire charge of his machine that he appears to be designing his own flight-path curves rather than modifying or damping the natural curves of the equation. It is quite true that this is one way to fly; it is, in fact, the old Wright method of flying, the original Wright machines having been furnished with a front elevator carrying little or no load. That type of machine, however, may be regarded as a thing of the past. The Wright machine could be "piled up" by inattention or want of skill at any moment, and if once its flight velocity fell below a certain value, either from want of attention on the part of the pilot, or from a wind gust from abaft, or other cause, the pilot was definitely unable to restore his normal flight condition; it is for this reason that the Wright type of machine has been abandoned.*

2. *Catastrophic Instability.*—Before entirely quitting this branch of the subject, attention will be directed to a point first raised by me within the last twelve months under the title of Catastrophic Instability. It is a curious fact that, although the author and other investigators had been studying the question of stability by various methods for some twenty years, more or less, and such items as longitudinal stability, lateral stability, and a form known as asymmetric or "rotative" stability, have been "catalogued" and investigated, both theoretically and experimentally, a form of instability which may in practice be far more serious and deadly, has until quite recently escaped notice. There are certain types of flight model, of which the ordinary "ballasted plane" is an example, in which the flight-path is ambiguous. In the case of the ballasted plane† the position is quite simple; this type of model is symmetrical, it has no "upside down"; if launched at its correct flight-velocity to travel on flight-path No. 1 (Fig. 1) it is equally capable of travelling on an alternative flight-path intermediate to those numbered 11 and 12, the only determining factor being whether at the moment of launching the pressure reaction is in an upward or downward direction. A very slight want of skill in launching one of these ballasted planes gives at once the inverted flight-path (Fig. 4); likewise a gust or disturbance acting on a model of this kind in flight, may be sufficient to invert the flight-path and determine its downfall. From our present point of view, regarding the air as the "permanent way," the position is as though the model, or machine, were continually crossing a number of facing points arranged, not quite as on a railway, but in a vertical sense (Fig. 5), so that the machine is always in danger of being switched off on to an inverted flight-path, $a\ a$, if an aerial disturbance of the right kind and sufficient magnitude and duration happen to be encountered.*

In my opinion the soundest way to avoid danger from this cause is experiment in a wind channel with scale models, both of the aerofoil and of the machine as a whole, prepared from the working drawings.

According to the evidence that has up to the present been collected the lift diagram for any machine passes without break of continuity from positive to negative values, and the angle of inclination is a single valued function of the pressure reaction $a\ a$, Figs. 6 and 7. The pitching moment in some cases is a curve of similar character, $b\ b$, Fig. 6, in other cases it is of the form $b\ b$, Figs. 7*a* and 7*b*, the latter of which represents the case of the ballasted plane. In Fig. 6 the model may be considered as catastrophically stable, but in Figs. 7*a* and 7*b* there is instability; there are three positions, or attitudes, of the machine, at which the pitching moment is zero, the two outer two, p_1 and p_2, defining respectively the stable positions of normal and upside-down flight, and p_3 marking the critical angle of unstable equilibrium when the machine passes from one state to the other.

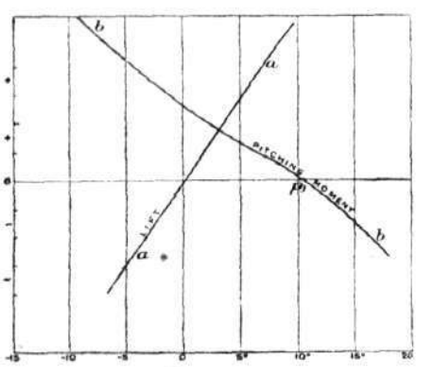


Fig. 6.

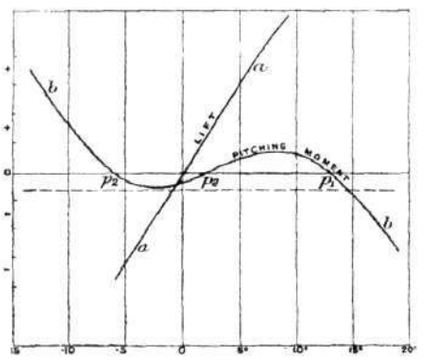


Fig. 7a.

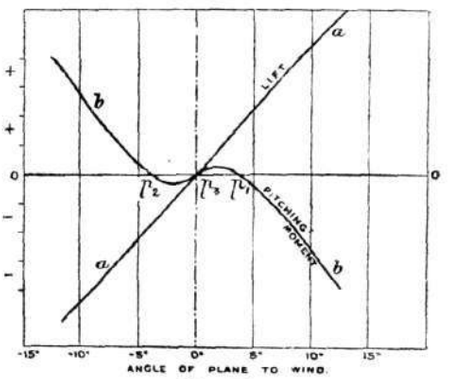


Fig. 7b.

In Table II are given results of some experiments recently carried out with a model machine at the N.P.L. These were not directed to the point in question, but incidentally serve as an apt illustration, and roughly form the basis of the plotting, Fig. 7*a*.

TABLE II.

Angle of pitch. Chord as datum.	Pitching moment.
− 14	+0·0264
− 12	+0·0152
− 10	+0·0063
Angle of stable equilibrium upside down.	
− 8	−0·0015
− 6	−0·0059
− 4	−0·0049
− 2	−0·0014
Critical angle or catastrophic change of flight-path.	
0	+0·0030
2	+0·0070
4	+0·0102
6	+0·0210
8	+0·0218
10	+0·0127
12	+0·0072
14	+0·0026
Angle of stable equilibrium right way up.	
16	−0·0043
18	−0·0173

In the experimental figures as tabulated, the evidence of catastrophic instability is seen in the column headed pitching moment;

* Practically the whole of the distinctive features of the early Wright machine have disappeared to-day; for example, the tailless machine is a thing of the past, nearly every modern machine is fitted with a tail plane. The forward elevator is obsolete or nearly so. The twin propeller has given place to the single propeller in almost every case. The gear-driven propeller also has been abandoned. The vertical four-cylinder or motor-car type of engine has proved itself inadequate. The exposed position of the pilot, engine, &c., has gone, never to return. The Wright method of launching on runners and alighting on skids also is a thing of the past. The biplane construction and the fore-and-aft vertical surface have to some extent survived, but these features were in no wise new when adopted by the Wright Brothers. The wing warping and vertical rudder (neither feature in itself new), operated by the Wright Brothers from one control lever in common, are nowadays operated from two entirely separate controls.

† A rectangular plate of mica, conveniently 0·003 inch thick, 8 inches by 2 inches, ballasted at the centre of the leading edge. Compare *Aerial Flight*, vol. i, p. 231; vol. ii, p. 4.

* The disastrous nature of this sudden inversion of the flight-path may be gauged from the fact that it represents in effect a complete reversal of gravity, the machine is accelerated downwards with a force comparable to that previously giving it support, and any loose tools, instruments, or fitments, including the pilot himself, are liable to be jettisoned by the machine, whose subsequent career is an upside-down flight carried out on its own account. The facts on record relating to the fatal accident to Major Merrick at the Central Flying School (October 3rd, 1913), point strongly to catastrophic instability as the cause.

whenever there are three changes of sign the model is catastrophically unstable.

Referring to Fig 7*a*, it may be observed that the character of the pitching-moment curve depends primarily upon the form of the aerofoil, the position of the centre of gravity, and the effective area of the tail member. By altering the angle of the tail plane (or by altering its effective angle by moving the flap known as the elevator), the datum line of Fig. 7*a* is in effect raised or lowered, but the form of the curve itself is not materially changed. It is evident, therefore, that a given machine may be catastrophically stable within certain limits of the adjustment of its elevator, that is to say, referring to Fig. 7*a*, it will be seen that the datum line may either cut the curve

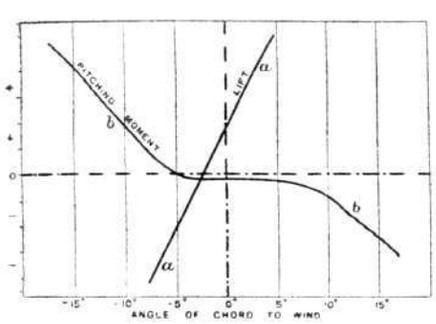


Fig. 8.

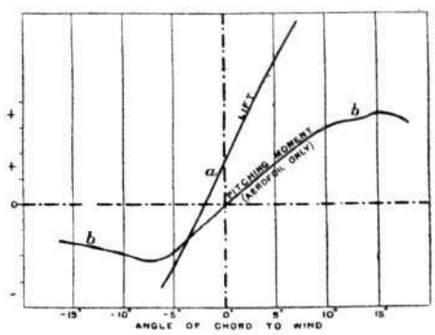


Fig. 9.

once or three times ; the range of adjustment of the elevator that results in cutting the curve once leaves the machine catastrophically stable, but when the elevator is adjusted so that the datum line cuts the curve three times the machine is catastrophically unstable. In such a case as that shown by the dotted datum line in Fig. 7*a*, in which the machine is catastrophically stable, the form of the pitching-moment curve is still open to objection. Not only is it always possible for the pilot to bring about catastrophic instability by an otherwise well-intentioned movement of his elevator, but the restoring couple for pitching beyond a small amplitude ceases to follow even approximately the straight line law, a fact that inevitably imperils the flight-path stability. Even when, as illustrated in Fig. 8, the pitching-moment curve, *b b*, never passes the horizontal, and so catastrophic instability is no longer to be feared, the conditions are not satisfactory, since there may be a considerable change of attitude of the machine without giving rise to any commensurate restoring couple.

The undesirable kink in the pitching-moment curve, shown in Figs. 7*a*, 7*b*, and 8, is due to the movements of the centre of pressure of the aerofoil itself in relation to the position of the centre of gravity. The tail-plane alone will give a pitching-moment curve of the type illustrated in Fig. 6, but the fore and aft change of position of the centre of pressure of the aerofoil, at different angles of attack, gives rise to a pitching-moment curve whose exact character depends upon the

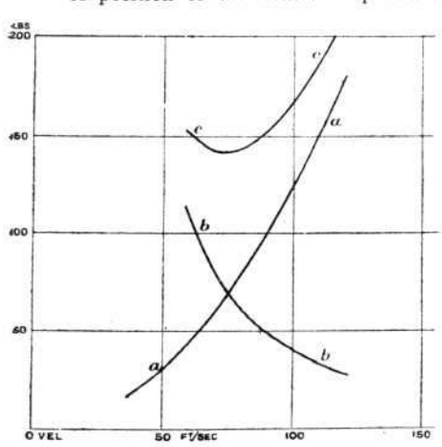


Fig. 11.

position of the centre of gravity. Should this correspond to a positively loaded tail, a curve of the type *b b*, Fig. 9, will result ; this, superposed on the tail component, imparts to the pitching-movement curve of the complete machine the kink shown in Fig. 7*a*.

In order to definitely make sure of a satisfactory pitching-moment curve for the complete machine, the pitching-moment curve of the aerofoil alone should, at no point, exhibit an inverse trend. To achieve this it is necessary to bring the centre of gravity appreciably in front of the most forward position of the centre of pressure of the aerofoil, so that the tail plane will under all conditions carry a slight negative load. Taking it as a basis that at the worst point the pitching-moment curve for the aerofoil alone shall be horizontal (the form of curve shown in Fig. 8), the geometrical construction given in Fig. 10 may be employed to give a suitable location to the centre of gravity ; here the locus of the centre of pressure (as experimentally determined) is given by the line *a a a*, the pressure-reaction curve is shown by the line *b b b*, the dynamic zero being on the line O Y. A number of tangents to the pitching-moment curve

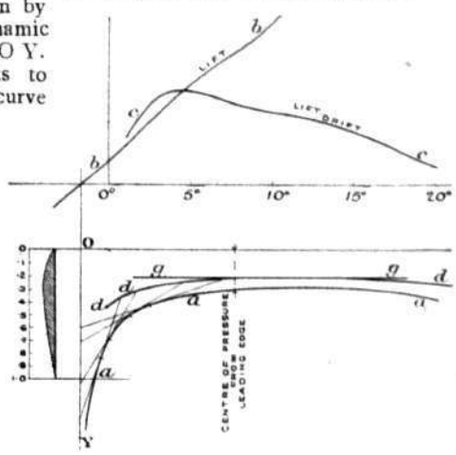


Fig. 10.

are drawn at random from points on the axis O Y, and are produced a distance equal to their own length beyond the point of contact, the extremities of these tangents defining a curve *d d d*. Draw *g g* tangent to *d d d*, then the centre of gravity should be situated on, or forward of, the line *g g*. The location of the centre of gravity on this line gives a pitching-moment curve for the aerofoil alone whose point of inflection is horizontal (as in Fig. 8). If we assume the machine flown at a normal speed corresponding to the maximum lift/drift ratio of the aerofoil (curve *c c c*), the centre of gravity in this particular case is one-eighth of the chord length in advance of the centre of pressure. Assuming the tail length equal to three times the chord (as in the B.E.2 type of the R.A.F.), this is equivalent to a negative load on the tail equal to 0·04 (4 per cent.) of the weight of the machine.* A machine so ballasted may be regarded as absolutely secure from catastrophic instability and as having a pitching-moment curve of an adequate character.

In connection with the present subject it is worthy of remark that in a well-designed aerofoil the most forward position of the centre of pressure is never far removed from the point of maximum lift/drift ratio ;† this fact is of importance, inasmuch as it permits a considerable range of movement round about the attitude of normal flight without introducing grave irregularities in the pitching-moment-curve. Were it not for this the required conditions might frequently be far more difficult of fulfilment than is actually the case.

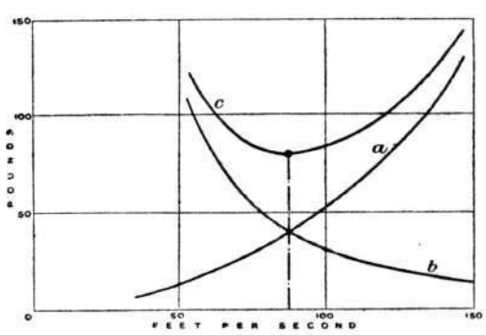


Fig. 12.

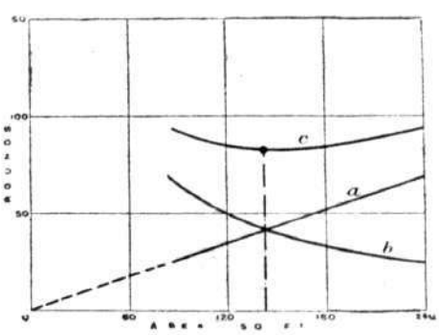


Fig. 13.

* A similar conclusion was reached by the author some eight years ago, based on an entirely different method of investigation. For model experiment a negatively loaded tail was found to be advantageous ; the figure 0·035 is given in *Aerial Flight*, vol. ii, p. 335. It is desirable to work with a less proportion of negative load from the point of view of keeping the resistance low ; evidently the matter is one for compromise.

† This is not in the nature of a coincidence, a well-designed aerofoil at its attitude of least resistance meets and leaves the stream-lines representing the relative air-flow (in the region of its mid-section) conformably. Under these conditions small changes of attitude one way or the other do not cause any abrupt change in the aerodynamic system. Such expedients as flattening the extremities and giving a reflex curve to the trailing edge are also found to be of service.

3. *The Laws of Resistance.*—Having established the general character of the airway, or track on which the flying machine is sustained, we pass directly to the consideration of the law of resistance, as determining the coefficient of traction on which depends the power expenditure. It is customary, and it is correct, to regard the resistance encountered by a machine in flight as made up of two parts; firstly, the direct resistance, which varies approximately* as V^2, namely, that form of resistance common to flying-machines, dirigibles, motor-cars, ships, &c., in other words, the ordinary resistance experienced by any vessel or body in its passage through a fluid; and, secondly, the flight resistance proper which follows an entirely different regime.

So far as the pilot or aviator himself is concerned all the direct resistances may be regarded as of the same kind and grouped together, namely, the sum of the eddy-making and skin-frictional resistances due to the *fuselage*, the alighting chassis and the various struts, stays and spars, whether belonging to the body of the machine or aerofoil; also the engine resistance (if exposed), the radiator, and the frictionally exposed surfaces of the rudders, fins (vertical surface), and of the aerofoil itself. Resistance from all these causes varies approximately as V^2, and so can be represented by an equivalent normal plane, and this equivalent normal plane is one of the resistance constants of any given machine; it may be represented by a graph, *a a*, Fig. 11—a portion of a parabola—covering the range of speed of which the machine is capable.

From the point of view of the pilot the aerodynamic resistance *b b*, which goes to make up the total *c c* (Fig. 11), follows, within limits, the inverse square law, namely, varies as k/V^2, where k is a constant determined by the design of the aerofoil; there is a critical angle which defines the low velocity limit of this law, and at best the inverse square law is but an approximation; it is the correct law to assume for an undefined form of aerofoil, but every individual design has its own particular manner of variation, which must be ascertained by experiment. The experimental determinations for any aerofoil include, with the aerodynamic resistance, the skin frictional, and a certain amount of other inseparable direct resistance, so that if experimental values are taken these resistances should not be again included in the computation of the equivalent normal plane.

From the point of view of the designer things wear a somewhat different aspect, and a sharp line has to be drawn between two different classes of direct resistance. In the first place there is the body resistance, which is taken to include the resistance of all those parts such as *fuselage*, alighting gear, &c., which is independent of the design of the aerofoil. In the second place there is the direct aerofoil resistance, including the skin friction and strut and stay resistances, which are variables depending upon the area and span, and otherwise upon the design of the aerofoil itself. The designer can by sufficiently extending the aerofoil reduce the aerodynamic resistance (as shown by Langley) to as low a value as he pleases, within the limit prescribed by the question of the added weight; but this reduction in the aerodynamic resistance is accompanied by an increase of skin frictional and other direct aerofoil resistance, so that for any given machine and designed velocity there is an extent of aerofoil beyond which it does not pay to go; there is definitely a design of least resistance.

I have shown that, treating the matter from the broad standpoint of general theory, the condition of least resistance is reached when the aerodynamic and direct resistance of the aerofoil are equal to one another (*see Aerial Flight*, vol. i, ch. vii). This is illustrated by Fig. 12, in which (as in Fig. 11) *a a* represents the graph of the direct resistance ($R \propto V^2$), and *b b* that of aerodynamic resistance ($R \propto 1/V^2$), and *c c* is the total (ordinates = resistance, abscissas = velocity.) In Fig. 13 a similar result is shown in which the plotting is given for constant velocity (abscissæ = area), as representing more literally the problem as presented to the designer.

The general theory on which the foregoing result is based depends upon and is subject to the limitations of the $1/V^2$ law of aerodynamic resistance. This law corresponds to the straight-line law as correlating pressure and angle, and is a close approximation between useful limits but breaks down at a certain critical maximum angle (depending mainly upon the aspect ratio), as shown in the examples given in Figs. 14*a* and 14*b*. The square plane follows a straight line law up to about 30°, in the plane of aspect ratio = 6; the limit is about 12°, the breakdown of the law at these limiting angles puts a very definite limit to flying at low speed.

TABLE III—*Values of β (Angle of Trail) for Least Resistance.*

Aspect Ratio.	$\xi = 0.020$.	$\xi = 0.015$.	$\xi = 0.010$.
3	0·189 = 10·8°	0·163 = 9·3°	0·133 = 7·6°
4	0·196 = 11·2°	0·169 = 9·7°	0·138 = 7·9°
5	0·202 = 11·6°	0·174 = 10·0°	0·142 = 8·1°
6	0·206 = 11·8°	0·178 = 10·2°	0·145 = 8·3°
7	0·212 = 12·15°	0·183 = 10·5°	0·149 = 8·5°
8	0·218 = 12·5°	0·189 = 10·8°	0·154 = 8·8°

I have demonstrated that the condition of least resistance implies, for an aerofoil of any given aspect ratio, a definite value of the angle of trail,* β, Fig. 15: the chord angle, except where a plane lamina is used, is an accidental quantity, and not, as frequently supposed, one of fundamental importance; calculated values of trail angle β for least resistance are given in Table III. Thus any aerofoil properly designed for least resistance for any given velocity of flight will be correctly designed for every other velocity provided that its load per unit area be varied as the square of the flight velocity.

It thus becomes possible to prepare tables of mean pressure values proper to least resistance for different flight velocities and different values of aspect ratio (Table IV). Tables III and IV are reproduced from my *Aerial Flight*, vol. i, pp. 261, 262 and 271, the variable factors in addition to the flight-speed being the aspect ratio, which is here shown as tabulated for values from 3 to 8, and the coefficient of skin-friction values of which are taken from 0·01 to 0·02 double surface coefficient. These values for skin friction are on the high side, but as an actual fact the values given do fairly represent the total direct resistance that in practice depends upon the area of the foil, and which requires to be included in the useful application of the theory; the higher values, generally speaking, represent more closely biplane conditions, and the lower values are more applicable in the case of the monoplane.

TABLE IV.—*Pterygoid Aerofoil. Load (lbs.) per sq. ft. for Least Resistance.*

	Flight Velocity. ft. per sec.	Values of Aspect Ratio. 3.	4.	5.	6.	7.	8.
$\xi = 0.020$	5	0·017	0·018	0·020	0·022	0·023	0·025
	10	0·068	0·075	0·082	0·089	0·094	0·101
	15	0·152	0·169	0·186	0·200	0·213	0·228
	20	0·270	0·300	0·330	0·355	0·379	0·405
	25	0·390	0·433	0·475	0·511	0·545	0·582
	30	0·610	0·676	0·743	0·800	0·852	0·911
	35	0·830	0·920	1·01	1·08	1·16	1·24
	40	1·08	1·20	1·32	1·42	1·51	1·62
	50	1·69	1·88	2·06	2·22	2·37	2·53
	60	2·44	2·70	2·97	3·20	3·40	3·64
	70	3·32	3·68	4·05	4·35	4·64	4·96
	80	4·33	4·81	5·30	5·70	6·07	6·47
$\xi = 0.010$	5	0·012	0·013	0·014	0·015	0·016	0·018
	10	0·047	0·053	0·058	0·063	0·066	0·071
	15	0·107	0·119	0·131	0·142	0·150	0·161
	20	0·190	0·211	0·234	0·253	0·267	0·287
	25	0·298	0·331	0·366	0·396	0·418	0·450
	30	0·427	0·475	0·526	0·570	0·601	0·645
	35	0·582	0·647	0·717	0·777	0·820	0·880
	40	0·760	0·845	0·935	1·01	1·07	1·15
	50	1·18	1·32	1·46	1·58	1·67	1·79
	60	1·71	1·90	2·10	2·28	2·40	2·58
	70	2·32	2·58	2·86	3·10	3·27	3·51
	80	3·04	3·38	3·73	4·05	4·27	4·59

* The V^2 law, it would appear, in no case exactly represents the actual facts; the departures from this law crop up in various and sometimes most unexpected directions. In the case of resistance due to skin-friction sufficient data exist to enable the degree of departure from the law to be computed; in other cases, as for example, in the pressure reaction experienced by an inclined plane or aerofoil, departures of a different kind have been demonstrated, and are being gradually elucidated by experimental investigation. In spite of these shortcomings, the foundation theory of flight is to-day, and probably will continue to be, based on the V^2 law.

* It is not easy to define the *angle of trail* of an aerofoil when the section is one of considerable body; clearly it is something intermediate between the upper and under surfaces, probably more nearly approximating to the former, as shown by the dotted line in Fig. 15.

(*To be continued.*)

AERONAUTICAL SOCIETY OF GREAT BRITAIN.

Official Notices.

Wilbur Wright Memorial Banquet.—Members of the Society will be interested to hear that Col. the Right Hon. J. E. B. Seely will honour the Society with his presence at the Royal Automobile Club on the 19th inst. The Right Hon. George Lambert, M.P., Sir H. F. Donaldson, Sir A. Geikie, Lord Montagu of Beaulieu, General Guthrie Smith, Hon. A. Stanley, Col. Squier (United States Embassy), Sir R. H. Brade, Rear-Admiral Sir Charles Ottley, Gen. von Donop, and Gen. Henderson are also amongst those who will be present.

Wilbur Wright Memorial Lecture.—The second "Wilbur Wright Memorial Lecture" will be delivered by Dr. R. T. Glazebrook, C.B., F.R.S., F.Ae.S., on "The Development of the Aeroplane," at the Royal United Service Institution, Whitehall, on Wednesday, the 20th inst., at 8.30 p.m.

The Right Hon. Lord Sydenham, G.C.M.G., F.R.S., will preside.

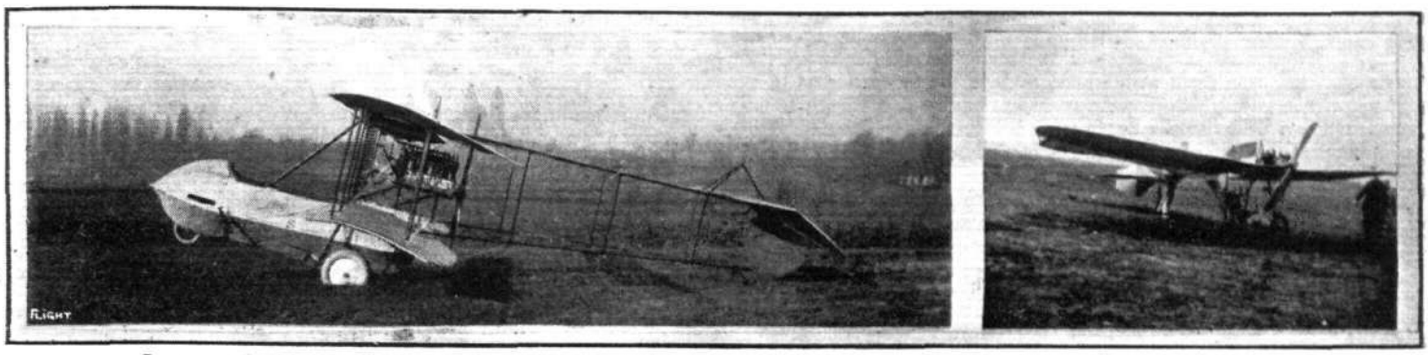
B. G. COOPER, Secretary.

FLIGHT

FOREIGN AIRCRAFT NEWS.

Record Height on Voisin Seaplane.

WHAT is claimed as a record height for a seaplane was attained by Rugere, at Frejus, on the 7th inst., when testing a Voisin machine, which has a Salmson engine of 120 h.p. It climbed to a height of 2,100 metres (6,890 feet) in 55 mins., and a similar performance was made on Saturday last when carrying a useful load of 300 kilogs.



On the left the latest Otto biplane. Right: Krumsick on a Grade monoplane at the Munster aerodrome.

Gordon-Bennett Race to be held at Buc.

AT last Saturday's meeting of the Committee of the Aero Club of France it was decided that the Gordon-Bennett Race should be held at Buc, and although the date was not definitely settled, it will probably be between the 19th and 26th of September. A great effort was made with a view to the race being held at Vichy, but Buc secured the verdict by a large majority, chiefly on account of the fact that there is there a fully-organised aerodrome, while it is within easy reach of Paris.

Some Modern German Machines.

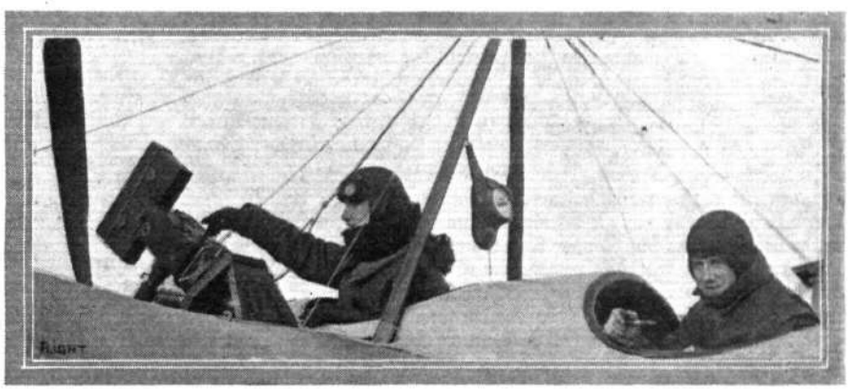
ON this page we reproduce several photographs showing some modern German machines, sent along by Mr. Ellis G. Frankl and Mr. Roberts, who have recently been visiting Germany making arrangements for looping exhibitions by Mr. Thornely. The photograph of the Rumpler Taube is particularly interesting, as the 100 h.p. Mercedes is specially arranged for working in an inverted position.

Vidart Retires from Aviation.

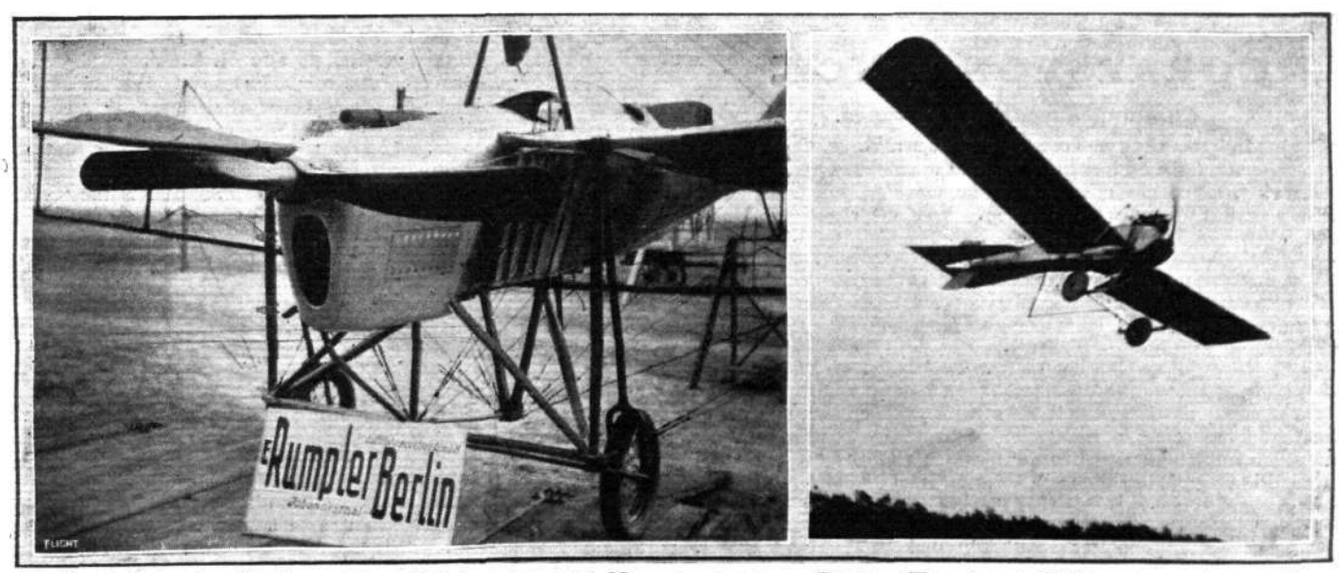
AFTER flying for nearly four years, Rene Vidart, who looped the loop fifteen times on Sunday week, has come to the conclusion that flying is too tame for him. He has, therefore, announced his intention of giving it up and going in for motor-car racing. If he fails to secure any of the chief prizes in the forthcoming races, he will then try big game hunting in Africa, or some sport of a similar nature.

Long Flight on a Blériot.

A SPLENDID flight, in spite of adverse weather conditions, was made recently by Lieut. Chabert, who on a Blériot tandem, and accompanied by a mechanic, flew from Lyon to Rheims and back, a round trip of 850 kiloms. The flight called forth a commendation from Col. Bouttieaux, who is in command of the first group of the French flying corps.



Linnekogel and a cinematograph operator on the Rumpler Taube.



Left: A Rumpler Taube with a 100 h.p. inverted Mercedes engine. Right: The latest Fokker monoplane with a 100 h.p. Mercedes engine, flying at the Johannisthal aerodrome.

Garros and Audemars at Buc.

THE only competitive event at the meeting at Buc on Sunday last was the *pingouin* race, which was won by Barault, a Blériot pupil. During the afternoon, however, a very fine exhibition of fancy flying was given by Legagneux and Audemars, both on 80 h.p. Gnome-Moranes.

The French Aeroplane Mother Ship.

FOR some considerable time the cruiser "Foudre" has been utilized as a mother ship for seaplanes belonging to the French Navy, but the machines carried on board had to be slung overboard and started from the surface of the sea. Recently, however, the cruiser has been fitted with a platform over the forward part of the ship, and tests which have been made show that, although it only provides a clear run of a dozen metres, seaplanes can be satisfactorily launched from it. As before, the machines will alight on the sea and be hoisted aboard the cruiser.

Mobilisation Tests in Germany.

A MOST extraordinary test of the organisation of the German Flying Corps was made last week. Orders were issued on Wednesday that three aeroplanes were to be sent to Doeberitz from the centres at Cologne, Posen, Konigsberg, Halberstadt, Metz, Strasburg, Darmstadt and Graudenz, all about 300 miles away. With the exception of the three from Darmstadt, which were prevented by a storm from starting, all the machines arrived at Doeberitz in good order, in spite of the bad weather. On the 7th inst., in response to further orders, twenty-three of the machines flew in close formation from Doeberitz to Hanover, and only one dropped out. We comment on this manœuvre at greater length on p. 505.

To Recognize German Aeroplanes.

IN order to assist in the identification of German machines when in the air, the German Aerial League has drawn up a scheme of marking each machine on the underside of the wings with a D in a circle signifying Deutschland (Germany) followed by a letter or combination of letters. Thus D.F.W. stands for the machine which is now well known over here by that designation, A.L.B. for the Albatros, E for Euler, R for Rumpler, F for Fokker, &c. Up to the present over 50 such marks have been registered.

Double Fatality in Germany.

WHILE making a test flight from Schwerin to Posen on the 9th inst., Lieuts. Faber and Kurtz were killed by the fall of their machine from a height of 200 metres when making a descent at the Kreckow camp near Stettin.

Pegoud at Milan.

ON the 6th inst., Pegoud gave an exhibition of looping, &c., at Milan, on the machine which he recently sold to the Italian aviator, dal Mistro, who then accused him of maliciously tampering with it. It was proved, however, that the part which Pegoud removed from the machine was simply a fitting he had attached for his own convenience, and he was acquitted. At the conclusion of his flights the crowd cleared the barriers, and Pegoud was carried shoulder high to his hangar.

Looping at Budapesth.

A TREMENDOUS crowd was attracted by an exhibition of looping, &c., which was given by Baron Pasquier on his Rhone-Blériot at Budapesth on the 9th inst. Among those present were the Archduchess Augusta, the Archduke Joseph and Prince Louis of Bavaria. A similar display was given on Sunday last.

New Head of Russian Flying Corps.

GENERAL ROPP has been appointed head of the Russian Flying Corps in succession to General Chichkevitch. On paying a visit of inspection to the Sebastopol aerodrome his motor car was met and escorted to the flying ground by a squadron of officers mounted on Nieuports.

Looping in Russia.

ON Sunday last Gaber Vlinsky looped the loop and flew upside down over the racecourse at St. Petersburg, while at the Katcha aerodrome, in the Crimea, T. Efimoff, brother of the well-known Russian pilot, M. Efimoff, gave an exhibition of looping the loop, tail slides, &c., on a Blériot-Gnome.

Fatal Accident in Russia.

AT the Russian military aerodrome near Sebastopol, on the 9th inst., Lieut. Hartmann was killed as the result of his machine falling from a height of 200 metres.

Military Flying in Morocco, &c.

AN *escadrille* of five Farman biplanes piloted by Lieuts. Cheutin, Menard and Battini, and Sergts. Hurard and Benoit set out on Wednesday of last week to make a complete tour, which will total 3,500 kiloms. of the French possessions in North Africa, including Morocco, Algeria, and Tunis. The first day's flight was from Tunis to Ain-Beida, a distance of 287 kiloms., the next day they went on to S. Mila, another 200 kiloms., and on Friday to Chellala, a further 290 kiloms. On Monday, Lieuts. Cheutin and Menard and Sergts. Hurard completed the first stage to Oudjda *via* Le Kneider, a trip of 460 kiloms. The new stage will be to Colomb-Bechar in Morocco, after which they will go to Gabes and then return to Tunis *via* Sfax.

A Fatality in Morocco.

ON the 5th inst. two military aeroplanes set out from Meknes to fly to Ito, with a view to establishing a line of stations along the route. One of the machines was piloted by Lieut. Ste. Lague, who was accompanied by Sergt. Bonnereau, while the other was in charge of Sergt. Fabre. The machine of Lieut. Ste. Lague capsized when at a height of 400 metres and crashed to the ground. The pilot was killed but the passenger escaped with slight injuries.

Turkish Officers Arrive at Cairo.

ON Wednesday of last week the two Turkish officers, Capt. Salim and Lieut. Kemal, having left Beirut on the 1st inst., progressed on their Blériot monoplane from Jerusalem to Port Said. Further progress was delayed by a mishap at Tel-el-Kebir, but they eventually reached Cairo on the 9th inst.

An Aeronautic Congress in America.

INDEPENDENT of the Aero Club of America and the Aeronautical Society, an aeronautical congress is being organised in America. At a meeting recently held in New York it was decided that temporarily C. D. Wolcott, Secretary of the Smithsonian Institution, should be president and E. L. Jones, secretary. It is proposed to invite 2,000 scientists to a meeting in August next at the Panama exposition to discuss aeronautics.

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CORRESPONDENCE.

Climbing Speeds of Machines.

[1857]. In letter 1854 your correspondent, Mr. A. M. Coate, raises a point which I should like to be allowed to challenge.

Roughly, his conclusions are that the machine will climb more rapidly against the wind than with it. Your correspondent has, I fear, fallen into this trap. He has neglected the fact that for all considerations connected with an aeroplane, the speed of the machine and that of the axial translation of the propeller *must* be measured *relative* to the air and not to fixed points on the earth's surface.

To quote your correspondent's own figures which are :—Speed of machine, 60 m.p.h. ; wind speed, 40 m.p.h. The earth speed against the wind will be 60 – 40, or 20 m.p.h., whereas with the wind the speed would be 100 m.p.h, the air speed being constant.

On these points alone it will be seen that the climbing *rate* will always be the same, whereas the gradient up which the machine will climb will be flattest when the machine climbs with the wind. I should like to put forth here a theory which to date appears to have escaped notice. It is, that a machine when climbing will be virtually heavier than in horizontal flight. This increase will, however, be the same, no matter what the ground speed of the machine.

S. C. SHEPLEY-PART.

Bedford Park, W.

Instruments at the R.A.F.

[1858] May I correct in your columns a misstatement accidentally made in another paper? The instruments designed at the Royal Aircraft Factory for aeronautical measurements can be obtained by all who desire so to do. The velometer is made by Elliott Bros. and G. Casella. The instrument for measuring gliding angles is made by the Cambridge Scientific Instrument Co., and so is the "Ripograph" which measures the rolling and other movements of an aeroplane.

Any aeronautical constructor asking how to obtain these instruments has been given the above addresses, and certain firms have had each of the above-named instruments in their private use.

The tautness meter was publicly described and is made by the C.S.I. Co.

The petrol flux and oil flux meters used in the engine competition are similarly available, and the drawings have been given to such competitors as asked for them.

May 9th. MERVYN O'GORMAN.

Sand Yachts—A Sailing Ground Wanted.

[1859] Will any of your readers who know the locality inform me of any firm broad sands within reasonable distance of London suitable for a sand yacht. They should be uncovered for most of the day, and some portions of them not frequented by children.

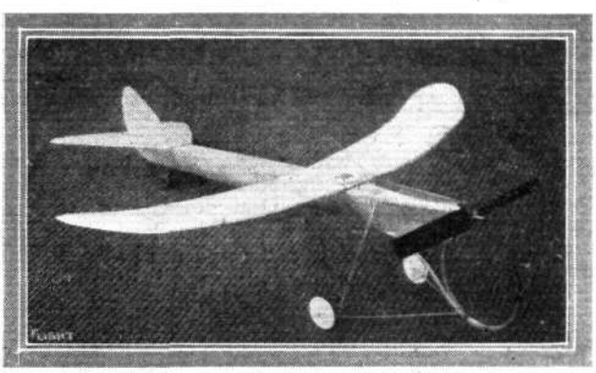
LANDLUBBER.

Models

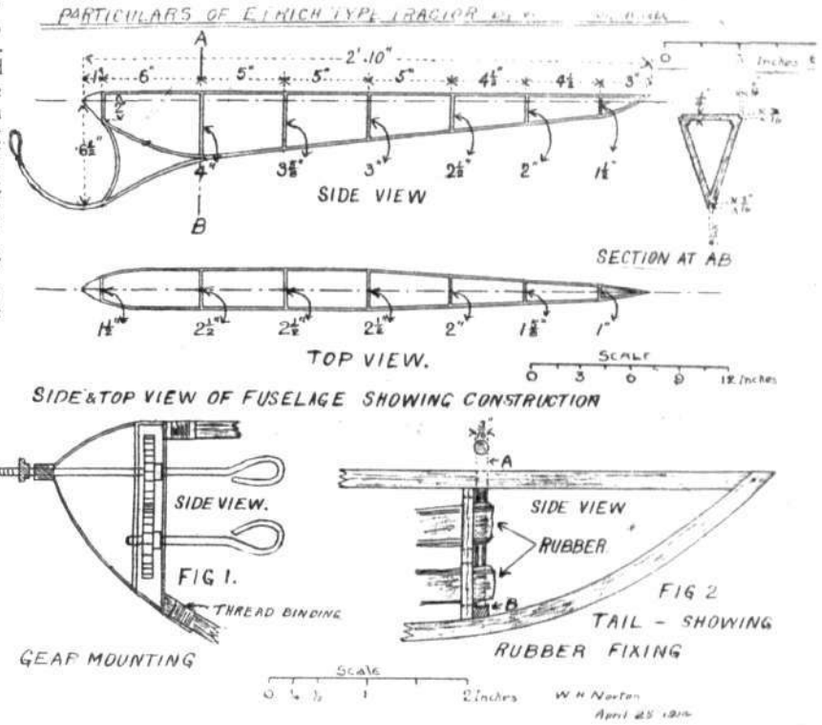
Edited by V. E. JOHNSON, M.A.

The Reigate, Redhill and District Club's Olympia Tractor Models.

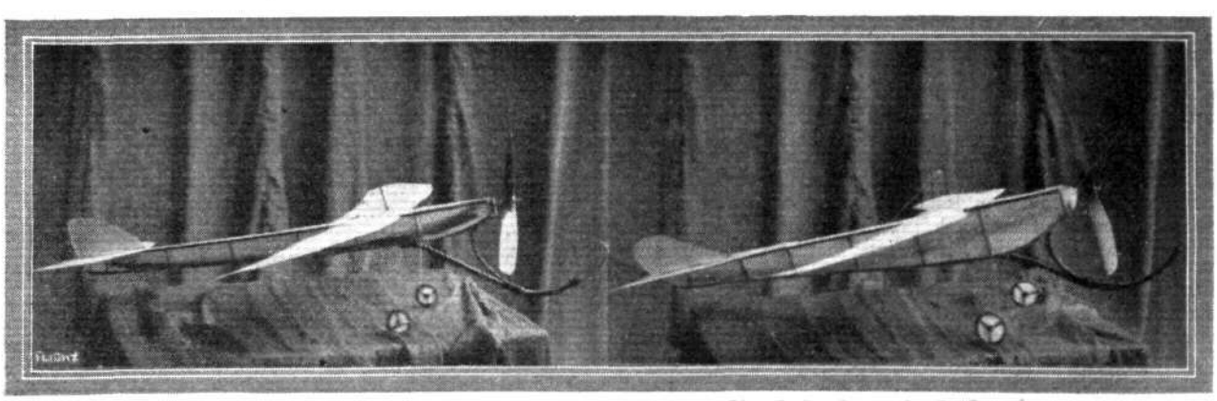
Etrich Type Tractor exhibited by Mr. W. H. Norton.—Length 2 ft. 11 ins. overall, span 3 ft. 3 ins., total surface 298 sq. ins. (M.P. 238, tail 60); weight 8½ ozs.; loading 4 ozs. to the sq. ft.; driven by two skeins (geared) of seven strands ¼ in. strip rubber. The *fuselage* (triangular) is built of silver spruce, $\frac{3}{16}$ in. by ⅛ in. "Formers" are of ⅛ in. three ply fretted out to required dimensions leaving section of ¼ in. The *fuselage* is covered in with Jap silk, doped with Emaillite. The gear is fitted as illustrated in Fig. 1. Bonn's $\frac{11}{16}$ in. gear wheels mounted on 15 gauge cycle spokes, and set in bearings of hard block tin. A frame of 20 s.w.g. piano wire is taken forward to a point in which is fitted a nipple, through which the propeller spindle runs, forming an extra bearing, and being covered in makes a pointed entry, thus obtaining full advantage of the propeller draught. The end of the *fuselage* is built as illustrated in Fig. 2, the curved lower member giving strength to the whole of *fuselage*, and also allowing the air to leave with as little shock as possible. The end "former" is fretted with two separate holes, allowing the two skeins of rubber to be passed through. A piece of $\frac{3}{16}$ in. round cane is passed through at A, and is kept in position by an aluminium receptacle, B. This arrangement is lighter than wire hooks, the tail being where lightness is especially required in this type. The skid is of cane; chassis of 18 s.w.g. wire; wheels, which have special springs, are turned out of ⅛ in. three ply, then fretted leaving three spokes, covered with Jap silk and doped with Cellon; they are 2½ ins. diameter and the pair weighs 3 drams. The plane is built of 20 s.w.g. piano wire with silver spruce main spar running from tip to tip, tapered each way from centre to give varying camber, it is partly double surfaced with a slight dihedral angle, set with the leading edge (at the body) in line of thrust. Angle at body 1 in 29 positive, at tip 1 in 24 negative braced, covered with Bonn's aero fabric. Tail is of the long triangular form usual in this type, stabilizing only, made of 20 s.w.g. wire covered with Bonn's aero fabric; it is removable to attend to the rubber, which is dropped in with a plumb line. The tractor screw is helical, 16 ins. pitch, 11½ ins. diameter. This model did not fly at Olympia trials, being soaked with rain, but good flights have since been obtained of from 30 to 35 seconds, although not more than 450 turns have at present been given. The stability of the model is extremely good. The drive is central, no arrangements being made with plane or rudder to oppose the torque. It rises off short grass. A straight flight has been obtained in calm air so that it was possible to calculate the efficiency. This flight was 173 yds., with about 23 yds. glide. Taking 150 yds. propeller working with 16 ins. pitch and 450 turns gives an effective pitch of 12 ins., which is 75 per cent. efficiency. The weight of rubber is 1½ ozs.; weight of model, 8½ ozs., a power rate of 1 in 5⅜.



Mr. W. H. Norton's Olympia model.



Tractor Monoplane shown at Olympia by Mr. J. L. Sutton. Length 2 ft. 10 ins.; span 3 ft.; total surface 252 sq. ins. (main plane 198 sq. ins., tail 54 sq. ins.); weight 7 ozs.; loading 4 ozs. to 1 sq. ft.; driven by two skeins (geared) of 6 strands of ¼ in. strip rubber. The *fuselage* is built of ⅛ in. square silver spruce on 3-ply formers, and covered with Bonn's aero silk; the skids of cane; the chassis of 18 s.w.g. piano wire; wheels ⅛ in. 3-ply wood, turned and fretted out, leaving 3 spokes, and covered with lawn doped with Cellon; the gear is Clarke's ½-in. gear; wheels mounted on 15-gauge cycle spokes, set in frame of hard block tin; the main plane (H.P. type) built of 20 s.w.g. piano wire, with silver spruce spar

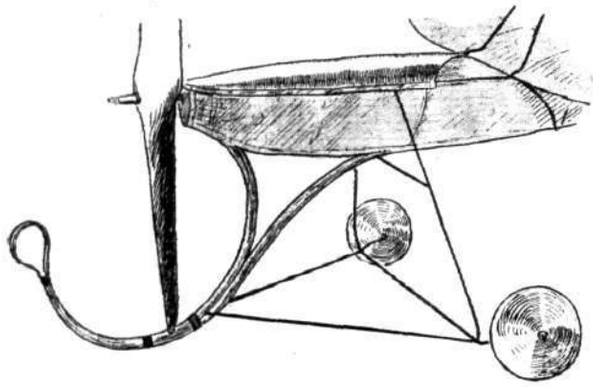


Mr. W. Key's Olympia tractor model.

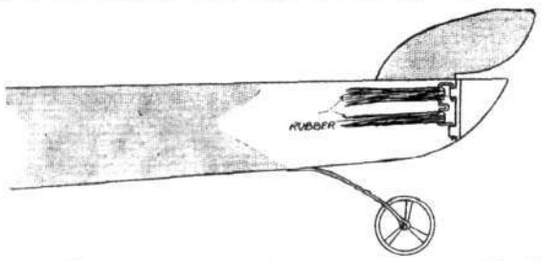
Mr. J. L. Sutton's Olympia model.

tapered to give varying camber and angle of incidence, braced from centre pylon, covered with Bonn's aero silk; tail of 20 s.w.g. piano wire covered with Bonn's aero silk, stabilizing only, and is removable to attend to the rubber motor; the tractor screw is 11 ins. diam. and 19 ins. pitch (not as shown at Olympia). This model did not fly at Olympia trials owing to the *fuselage* and supporting surfaces being saturated, but flights have been obtained of 30 to 40 secs. The propeller drive is central, and no arrangements are made with the wings or rudder to overcome the torque.

Tractor Monoplane exhibited at Olympia by Mr. W. Key. Length 2 ft. 10 ins., span 3 ft.; the main plane has a surface of 192 sq. ins.; the tail an area of 56 sq. ins.; total 252 sq. ins. [Where do the other 4 sq. ins. come in?]. Loading 4 ozs. to the sq. ft.; tractor screw 12 ins. in diam. and 20 ins. pitch; the main plane, which is of the Handley Page type, is covered with Bonn's proofed fabric. On Easter Monday, flights of 32 to 34 secs. were obtained with the machine not fully wound up, flying with the same power as was used in the trials at Hendon,



View of chassis and front skid of Mr. W. Key's model.



Tail view showing method of fitting rubber on Mr. Key's model.

where, owing to the model being soaked with rain, it did not give a very satisfactory account of itself. The propeller drive is central. One sketch shows the chassis and skid arrangements used on the machine, which are very good, and the other, the tail part of the machine, showing the method of fitting in the rubber, with the sides of the body completely covered in, which makes a clean run off for the air, instead of leaving an opening at the sides for fitting in the rubber, which causes a drag. The top part of the body is left open, underneath the tail, and a double wire hook, made as shown in the sketch, which drops into two small pieces of tube. The wheels are cut from $\frac{1}{8}$ in. 3-ply wood, and afterwards covered in.

Mr. W. H. Nosworthy's Dihedral Biplane.

Mr. J. G. Navarro (58, Berners Street, Leicester), writing *re* the above, says: "As you will see by the enclosed [Patent 27,282, 1910]., the above gentleman is not the inventor of this identical biplane. I entered this machine for the 1913 Aero Exhibition, but unfortunately it got damaged in transit. It, therefore, was not exhibited, but a monoplane in its place. This model also includes negative fixed tails and air brakes, two special features of the last Aero Show on the Bristol Co.'s stand by Mr. A. V. Roe respectively, these being embodied in the one machine as you will see from the drawings. They constitute an absolutely fool-proof machine which cannot side-slip or make an involuntary head dive, and is the result of six years' experiment and research work, at present at a standstill for financial assistance. I should be glad if you can find space for the above, and also the drawings." [We regret want of space precludes the publication of the drawings for the present.]

Mr. W. H. Nosworthy also writes pointing out a clerical error which ascribed the prize as awarded to exhibit No. 206, which should have been No. 207. The winning model was, however, *described* correctly. Mr. Nosworthy adds: "It may interest you to know that since the Exhibition I have built a 9-oz. model (biplane hydro.) on the dihedral principle, tail included [and, we presume, floats as well]. This waterplane rises quickly and gives a good flight, alighting easily on its floats. Tractor, 2 ft. 4 ins. span; length, 2 ft. 6 ins." [We should be glad to learn the position of the propeller in this model.]

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KITE AND MODEL AEROPLANE ASSOCIATION.

Official Notices.

French Kite Meeting.—A series of Kite Competitions will be held on the Inquéterie Race Course, Boulogne, on May 30th and 31st and June 1st. Prizes to the value of 2,000 francs will be given. The competitions are for man-lifting teams, photography, telegraphy, signalling, ship to shore, &c. Full details will be sent by the hon. sec. on application.

Anglo-American Exhibition.—Will all intending exhibitors send in their models addressed to the Aviation Section, Anglo-American Exhibition, Shepherd's Bush, as soon as possible, advising Col. H. S. Massy, Administration Buildings, of their despatch?

Affiliation.—The official programme goes to press during the next few days, therefore all clubs intending to become affiliated should apply at once, sending in the names of gentlemen who will act as official observers, so that the list of clubs, &c., shall be complete in programme.

Gift of Prizes.—Major B. Baden-Powell has presented the team medals for the winners and runners-up in the Farrow Shield Competition, this being for 8 oz. models, as Class IIA at Olympia.

27, Victory Road, Wimbledon. W. H. AKEHURST, Hon. Sec.

AFFILIATED MODEL CLUBS DIARY.

CLUB reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Leytonstone and District Aero Club (64, LEYSPRING ROAD).

MAY 17TH, at 6.30 a.m., flying Wanstead Flats; at 10.30 a.m., tractor duration competition. May 24th, twin-screw r.o.g. duration competition, 8-oz. models; 4-oz. loading models must rise off grass.

Paddington and Districts (77, SWINDERBY ROAD, WEMBLEY).

MAY 16TH, flying at Sudbury. Competition for r.o.g. average duration. Prizes, silver and bronze medals.

UNAFFILIATED CLUBS.

Finsbury Park and District (32, ASHLEY RD., CROUCH HILL, N.)

MAY 23RD, practice flying Finsbury Park from 3 p.m. Speed contest at 4 p.m.

S. Eastern Model Ae.C. (1, RAILWAY APPROACH, BROCKLEY).

WEEK-END flying Woolwich Common, Blackheath and Grove Park at usual times. Members are reminded that the first round of this quarter's "Trophy" competition will be flown at the end of this month.

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PUBLICATIONS RECEIVED.

L'Essor et l'Atterrissage. By Maurice Percheron. Paris: H. Dunod and E. Pinat, 47-49, Quai des Grands-Augustins. Price 4 frs. 50.

Rendiconti delle Esperienze e Degli Studi. Part I of Vol. III. Rome: Tipografia della R. Accademia dei Lincei.

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IMPORTS AND EXPORTS, 1913-1914.

AEROPLANES, airships, balloons, and parts thereof (not shown separately before 1910). For 1910 and 1911 figures, see FLIGHT, January 25th, 1912, and for 1912 and 1913, see FLIGHT for January 17th, 1914:—

	Imports.		Exports.		Re-Exportation.	
	1913.	1914.	1913.	1914.	1913.	1914.
	£	£	£	£	£	£
January	12,097	5,945	4,005	210	1,510	879
February	17,361	28,132	3,447	106	690	441
March ...	20,425	27,731	1,924	1,934	1,042	1,440
April ...	15,593	11,384	5,524	1,175	1,413	1,473
	65,476	73,192	14,900	3,425	4,655	4,233

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Aeronautical Patents Published.

Applied for in 1913.

Published May 14th, 1914.

9,028. E. R. CALTHROP. Parachutes.

9,376. NEUFELDT AND KUHNKE AND GES. FUR NAUTISCHE INSTRUMENTE. Hydro-aeroplanes.

23,708. A.E., H.L. AND H. O. SHORT. Aeroplanes.

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